

FLIGHT

First Aero Weekly in the World.

Founder and Editor; STANLEY SPOONER.

A Journal devoted to the Interests, Practice, and Progress of Aerial Locomotion and Transport.

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EDITORIAL COMMENT.

Aircraft in Warfare.

Ever since the war commenced aircraft has loomed large in support of each of the nations—by the Allies as well as by the enemy—engaged in the present great struggle. It would seem, however, as if the climax in efforts of the aviation sections of both sides had been reserved for Christmastide. The startling, but not surprising, work of which such graphic accounts have been published was supplemented by other minor aircraft activities in the other countries whose armies are engaged in the fight for or against militarism.

By way of a preliminary to the Christmas adventures some encouraging details of the general work of the flying officers appeared in "Eyewitness's" report issued on Monday, in which it reads: "Though the weather has been generally unfavourable to aviation, several reconnaissances have been made by members of the Royal Flying Corps, and there have been three encounters in the air between British and German aeroplanes, as a result of which the hostile machine has, in each case, been forced to go down in the German lines. In addition to the more striking raids over the enemy's country that

are made from time to time, the report states that there is an immense amount of courageous, patient routine work being done from day to day by the Flying Corps, the arduous and risky nature of which has been increased as well by the extreme cold as by the fact that, with constant practice, the gunners of the enemy's anti-aircraft guns have become more and more expert."

The Brilliant Feat of the Royal Naval Air Service.

The performance, however, which stands out above all others in the week's aviation events, and one that will be handed down in history, is the daring raid that was carried out on Christmas Day by officers of the Royal Naval Air Service. As every daily paper in the land has recorded, working in conjunction with our fleet in the North Sea, seven seaplanes started off at daylight, from a point in the vicinity of Heligoland, for an attack on the German warships lying in the Schillig roads at the mouth of the Elbe off Cuxhaven.

The official report issued by the Secretary of the Admiralty is, as usual, extremely brief; it shows, however, that the seaplanes were escorted by a light cruiser and destroyer force, together with a number of submarines. As soon as the ships were observed by the Germans from Heligoland, two Zeppelins, together with three or four of the enemy's seaplanes, took up the defence, backed by several submarines, and ranged up for a counter attack. It was part of the plan for the British ships to remain in the neighbourhood in order to pick up the returning pilots, and a combat hitherto only depicted by imaginative artists ensued between the most modern cruisers, seaplanes, dirigibles, airships and submarines, each in its element above or under the water or in the air. By consummate manœuvring, our vessels avoided the submarines, and the two Zeppelins pretty quickly took the hint from the guns of the "Undaunted" and "Arethusa" that a retreat on their part was the only course open to them. The enemy's seaplanes were more daring and succeeded in dropping bombs near to our ships, but fortunately with never a hit to record.

In the meantime the British flying officers were well on their way to Cuxhaven, whilst our warships, ready for any emergency, quietly awaited their return—in striking contrast to the "cut and run" example recently set by the German Navy in their precipitate retreat after bombarding "fortified" Scarborough, Whitby and Hartle-

pool. Thus, not only did our warships safely pass through the enemy's mine field, but they remained unharmed in Germany's nearest home waters for nearly three hours, and safely re-embarked three out of the seven air pilots together with their machines. Three others of the flying officers, who returned later, were picked up by British submarines which were standing by for that purpose, whilst their machines were ensured against future use by the enemy by their being sunk.

The names of the pilots who entered on this stirring raid, were: Flight Commanders Douglas A. Oliver, Francis E. T. Hewlett, Robert P. Ross, and Cecil F. Kilner; Flight Lieutenants Arnold J. Miley and Charles H. K. Edmonds; and Flight Sub-Lieutenant Vivian Gaskell Blackburn.

While there is much cause for congratulation in the result of the raid, and in the fact that of this gallant band six succeeded in returning safe and sound, yet it is with the greatest concern that no news at present has come to hand of the safety of Flight Commander F. E. T. Hewlett, whose machine is said to have been seen in a wrecked condition about eight miles from Heligoland. There is a possibility that he may have been picked up by one of the enemy's ships, although too much reliance cannot be placed upon this ray of hope; and whilst wishing that Flight Commander Hewlett may still be heard from, we, in the meantime, offer our sincerest condolence to those left to mourn his loss, and we trust that they may be able to find some degree of consolation in the fact that he has given his life for his King and Country. To his mother, Mrs. Maurice Hewlett—one of the few lady pilots of the world—it must come as a great blow, as it is due to her splendid work and enthusiasm as a pioneer in aviation that her son was initiated into the art of flying, thus opening up his career, which may now have passed its final and glorious, if sad, stage.

The Effect of the Raid. The raid stands out in marked contrast from the attacks in which the Prussian Huns have recently been indulging. Unlike them, we have deliberately denied ourselves any advantage that might be gained by ignoring civilised conventions, and have been content to wage war according to the accepted rules of modern warfare. Consequently, the nation may take a legitimate pride in the brilliant attack on that section of the German Navy which has so long been hiding itself safely in the vicinity of Cuxhaven, and may sincerely trust that some of the bombs that our men left behind them succeeded in reducing the efficiency of one or more of the vessels.

The raid was probably assisted, and yet, at the same time, possibly robbed of some of its effect, by the fog which hung over the mouth of the Elbe, for unfortunately, to use the words of the official report, "the extent of the damage by the British airmen's bombs cannot be estimated." Enlightenment on this point is not forthcoming from the German press, which, ominously, has had remarkably little to say upon the subject. The enemy, just as was announced in the case of our aerial visits to Düsseldorf and Friedrichshafen, officially claims that no damage or injury was done. As in the previous cases, we may beg leave to doubt these official utterances, especially as, in this case, telegrams from Denmark and Holland agree that they are not in accordance with facts. Although some of the bombs dropped may not have found their billet, there can be little question that some

at least did fall on points of military significance. It is unofficially reported, for example, that several German warships, which were the main objective of the raid, were damaged, and that we also succeeded in destroying an airship and its shed. One Zeppelin is also believed to have been hit by a shell from one of our cruisers.

The view has been expressed in some quarters that such raids have no practical military value; on the other hand, there are those who consider the attack on Cuxhaven to be the best strategical move we have thus far made. Whatever view be taken, the exploit was one of the most noteworthy yet recorded in the history of aviation as a branch of naval operations, and it may be safely assumed that the purpose for which it was undertaken was achieved. While we do not suggest that such raids will have a decisive effect on the duration of the war—the final issue resting, as hitherto, on the seas with ships of the line, and on land with legions of infantry and batteries of artillery—yet the moral effect on the enemy and its people is extremely important, bringing home to them, as it does, the fact that raiding—other than women and children slaughtering—is not the monopoly of Germany. Moreover, the suddenness and unexpectedness with which we have shown them that two can play at the game of dashing adventures has already created the greatest uneasiness in the so-called Home of Culture.

Nothing could have been more opportune than this incident as a commentary of the German Grand Admiral's recent high-flown statements that the German naval forces have the command of the seas which separate the United Kingdom from Northern Europe.

There was plenty of opportunity for the German fleet to make good their claim, for this exploit was not an undertaking of the German variety as exemplified by the bombarding of unfortified towns on our North-Eastern Coast, but was an enterprise directed towards, and strictly confined to, legitimate war ends. In other words, it was no lightning-knock on an undefended door, followed by a rapid flight for safety, but a well conceived and calmly carried out hostile visit of three hours' duration, during which British flying officers forged their way over the German harbours and warships.

Thanks to its mastery of the seas, our Navy, as it has once again shown, can select its own moment to send its seaplanes, its cruisers, and its submarines, across the North Sea, and Germany cannot say it nay. Indeed, one of the striking features of the raid, and one that says little for the reputed bravery and daring of the German Navy, is that not a single enemy battleship, cruiser, or destroyer put in an appearance during the attack. Nor is the fact that the bombs and torpedoes directed at the British vessels all fell harmlessly into the water without its significance.

Romance Outrivalled by Modern Warfare.

The Cuxhaven raid marks the first employment of the seaplanes of the Naval Air Service in an attack on the enemy's harbours from the sea, and, apart altogether from the results achieved, is an occasion of historical moment. Not only so, but for the first time in history a naval attack has been delivered simultaneously above, on, and from below the surface of the water.

The exploit has caused a thrill of patriotism throughout the length and breadth of the Empire, showing, as it does, that the old spirit of our seafaring forefathers still exists. With our cruisers, swiftly manoeuvring to avoid the German submarines and their torpedos, while, at the

same time, their gunners were busy beating off the Zeppelins; with enemy seaplanes also swooping over our vessels in a vain effort to drop bombs on them, or manœuvring against our own aircraft as the latter dashed towards the German warships, all points to a scene the like of which almost surpasses even the wildest dreams of romancers. It also is a reminder, if reminder were needed, that the present war differs in its character from any previous war the world has witnessed or experienced. There is, for instance, an attractive suggestion of novelty in the employment of submarines to bring into safety the pilots of aircraft. Few there were, even a month or so ago, who could have imagined that ere 1914 closed submarines would be employed as the means of rescuing aviators "according to arrangement." In its daring attack on one of the enemy's strongholds, the different sections of our Navy, from the Flying Service downwards, have shown what gallant men can do, and we may rest assured that they are ready and willing to seize every opportunity of repeating, and even excelling, their historical achievement.

* * *

Precautions at Home. In fairness, it must be stated that we have not been alone in the matter of aerial attacks. During the week one of the enemy's aviators flew across the Channel and dropped a bomb on Dover, without, however, doing

any damage; while another, or possibly the same, pilot is reported to have flown on the following day along the Thames as far as Gravesend, and appears to have dropped a bomb at Cliffe, about five miles from Rochester. The flights were not remarkable as feats of skill and daring, for our flying officers do things requiring more nerve and endurance almost every day; moreover, they were entirely unproductive of results either of a military or moral value. Probably the main object of the visits was to provide the German people with a much-needed tonic to revive their spirits, and it is on this account that further trips of the kind may be anticipated. There is, however, no cause for alarm, having in mind that our coast line, as well as London, is being carefully watched and guarded; at the same time, the public will do well to take heed of the notice issued on Monday by New Scotland Yard, warning the civil population, upon hearing the sound of firing by guns or explosives, to keep under cover rather than to rush wildly into the streets. As "Dagonet" recently said, if the Zeppelins or other German aircraft do intend to come, "Let 'em come," for in putting their oft-repeated threat into execution, the enemy will afford those who have so long been waiting for them an opportunity of maintaining that ascendancy, which, in the opinion of Sir John French, our flying officers have secured over those of Germany.

* * * THE BRITISH AIR SERVICES. * * *

UNDER this heading are published each week the official announcements of appointments and promotions affecting the Royal Naval Air Service and the Royal Flying Corps (Military Wing) and Central Flying School. These notices are not duplicated. By way of instance, when an appointment to the Royal Naval Air Service is announced by the Admiralty it is published forthwith, but subsequently, when it appears in the LONDON GAZETTE, it is not repeated in this column.

Royal Naval Air Service.

THE following was announced by the Admiralty on the 24th ult. :—

F. Besson entered as Probationary Flight Sub-Lieutenant, with seniority of December 21st, and appointed to the "Pembroke III," for R.N. Air Service.

The following were announced by the Admiralty on the 28th ult. :
Temporary Surgeons: R. H. Pain, M.B., and H. Wilks, to the "Pembroke," for Royal Naval Air Service. To date Dec. 23rd.
A. G. Sworn and P. B. Kelly, to the "Pembroke III," for Royal Naval Air Service. To date Dec. 26th.

Acting Flight Lieutenants: C. W. H. Pulford and D. Harries, to the "Pembroke III," for course of training. To date Dec. 20th.

Probationary Flight Sub-Lieutenants: R. E. Nicoll, confirmed in rank, with seniority Sept. 7th, and appointed to the "Pembroke III"; A. S. Maskell, confirmed in rank, with seniority Oct. 12th, and appointed to the "Pembroke III"; D. K. Johnston, confirmed in rank, with seniority Sept. 11th, and appointed to the "Pembroke III," all for Royal Naval Air Service. To date Dec. 23rd.

Assistant Paymaster F. K. Haskins, to the "Pembroke III," as Flight Lieutenant, with seniority Oct. 3rd, for Royal Naval Air Service, to date Dec. 23rd.

R. Souray entered as Probationary Flight Sub-Lieutenant, and appointed to the "Pembroke III," for Royal Naval Air Service. To date Dec. 28th.

Royal Flying Corps (Military Wing).

The following appeared in the *London Gazette* issued on Dec. 22nd :—

The undermentioned flying officers to be Flight Commanders. Dated Dec. 11th, 1914: Lieut. Henry Le M. Brock, the Royal Warwickshire Regiment, and to be Temporary Captain. Lieut. Hyacinth J. A. Roche, the Royal Munster Fusiliers, and to be Temporary Captain. Lieut. Lord George Wellesley, Grenadier Guards, and to be Temporary Captain; and Capt. John F. A. Kane, the Devonshire Regiment.

Special Reserve. Supplementary to Regular Corps.—The under-

mentioned Second Lieutenants to be Lieutenants. Dated Dec. 1st, 1914: Norman C. Spratt and Gilbert B. Rickards.

The following appeared in a supplement to the *London Gazette* issued on Dec. 23rd :—

Special Reserve. Supplementary to Regular Corps.—Second Lieut. S. P. Cockerell is confirmed in his rank. To be Second Lieutenants (on probation):—E. S. Skipper, A. Huggins (Dec. 14th).

The following appeared in the *London Gazette* for Dec. 24th :—

Appointments made: Flying Officers—Major L. B. Boyd Moss, South Staffordshire Regiment; Capt. H. C. MacDonnell, Royal Irish Regiment, and to be seconded; Capt. R. A. Beger, R.E.; Capt. H. C. T. Dowding, R.A., and to be seconded; Capt. E. F. Unwin, A.S.C.; Capt. S. C. W. Smith, 3rd Battalion East Surrey Regiment, and to be seconded; Lieut. C. H. Marks, Reserve of Officers; Lieut. R. C. H. Bewes, King's (Liverpool Regiment), and to be seconded; Lieut. D. C. Ware, Special Reserve; Lieut. G. de Havilland, Special Reserve; Lieut. G. B. Rickards, Special Reserve (Hon. Capt. in Army); Second Lieut. C. G. Bell, Special Reserve; Second Lieut. R. R. Smith Barry, Special Reserve; Second Lieut. L. S. Metford, Special Reserve; Second Lieut. N. C. Spratt, Special Reserve; Second Lieut. V. A. Barrington-Kennett, Special Reserve; and Second Lieut. A. Payze, Special Reserve. Aug. 5th, 1914. Second Lieut. F. P. Adams, Special Reserve. Aug. 12th, 1914. Second Lieut. Archibald G. Weir, Special Reserve. Nov. 19th, 1914. Second Lieut. Hereward de Havilland, Special Reserve. Dec. 1st, 1914. Temporary appointments made: Flying Officers—Lieut. Eric M. Murray, Queen Victoria's Own Corps of Guides (Frontier Force) (Lumsden's), Indian Army; and Lieut. Latham V. S. Blacker, Queen Victoria's Own Corps of Guides (Frontier Force) (Lumsden's), Indian Army. Nov. 19th, 1914.

Second Lieut. Sydney W. Smith, Royal Horse and Royal Field Artillery, is seconded for service with the Royal Flying Corps (Military Wing). Dated Oct. 17th, 1914.

The following appeared in a supplement to the *London Gazette* issued on the 28th ult. :—

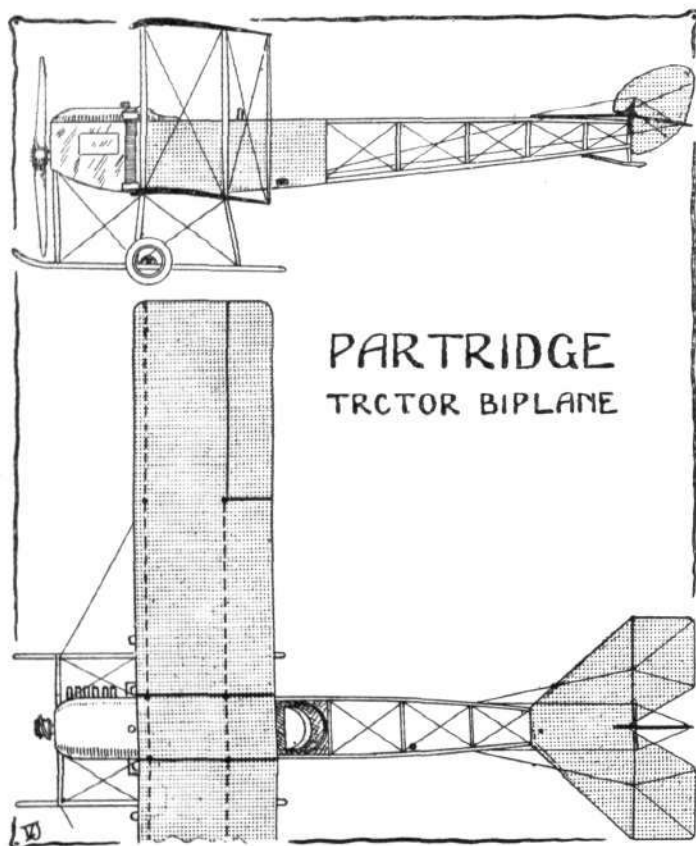
Second Lieut. Cecil H. Saunders, Royal Flying Corps, Special Reserve, to be Temporary Captain. Dated Dec. 29th, 1914.

Aeroplanes Captured in the Cameroons.

In an official account of the operations in the Cameroons compiled from reports received at the Colonial Office up to December 13th, it was stated that among the stores captured at Bare, on the Northern Railway, were two aeroplanes.

THE 50 H.P. PARTRIDGE TRACTOR BIPLANE.

THIS machine is one of the several successful tractor biplanes manufactured by Messrs. Partridge and Keller, of the Cicero Flying Ground, at Chicago, Ill. In actual practice all have proved to be very steady flyers, several well-known American pilots, including Miss Katherine Stinson, having put up creditable performances on them. The machine shown in the sketch plan and elevation was built during the latter part of last year, bearing several modifications of the earlier models as the results of experience. The main planes are built up on two



main spars of I-section ash measuring $2\frac{1}{4}$ ins. by $1\frac{3}{8}$ ins. front, and $2\frac{1}{4}$ ins. by $1\frac{7}{8}$ ins. rear respectively. The ribs consist of spruce battens and perforated webs. Between the front and rear spars, where the interplane struts are connected, are tapering compression members which relieve the ribs of any compression strains. Internal cross bracing is by $\frac{3}{32}$ -in. stranded cable. The wing section is a modified monoplane type, having a camber—on the under surface—of 3 ins. at a point 38 per cent. from the leading edge, and

with a slight wash out at the tips. The normal angle of incidence is about 2° . The top plane consists of three sections, a small central panel the width of the fuselage, and two outer sections which are attached to the inner section, whilst the lower plane is in two sections, one mounted on either side of the fuselage. Each outer cellule has two pairs of silver spruce struts situated close together near the wing tips, and the central section is supported on the fuselage by two pairs of tubular steel struts. External bracing is by heavy stranded cable, and the strut attachments are of the quick-detachable type enabling the planes to be easily detached. The planes are covered with linen treated with Emaillite. Hinged to the outer extremities of the rear spars of both top and bottom planes are ailerons measuring 7 ft. by 1 ft. 6 ins. Each top aileron is connected to that immediately below it by a spruce strut, and right and left hand pairs are interconnected, their operation being by means of Curtiss-type shoulder yoke. The tail consists of a triangular-shaped stabilising surface set at a slight negative angle mounted on the upper longerons of the fuselage. Hinged to the trailing edge of the stabilising surface are two elevator flaps with a partially-balanced vertical rudder in between, which is hinged to the last strut of the fuselage. The latter is of rectangular section built up of four ash longerons, with struts of silver spruce, except those in the engine section which are of ash.

The engine, a 50 h.p. 6-cyl. water-cooled Kirkham, is mounted in the nose of the fuselage, this portion being covered in with sheet aluminium. Behind the engine are the passenger's and pilot's seats, the former being in front, the fuselage being fabric covered as far as the rear or pilot's seat. Two radiators for cooling the engine are mounted one on either side of the fuselage between the engine and passenger. Sheet metal fittings are used in the engine section of the fuselage, and for the rest the usual U-bolts are employed, whilst the whole is strongly braced with cable. The landing chassis consists of two long ash skids connected to the lower longerons of the fuselage by three ash struts each, and a tubular steel axle carrying a pair of 20-inch wheels, which is attached to the skids by means of rubber shock absorbers. The skids extend forward of the 7 ft. 2 in. tractor screw, and are braced transversely by cable, no cross struts being employed.

The principal dimensions of this machine are: Span (top and bottom), 30 ft.; chord, 5 ft.; gap, 5 ft. 8 ins.; supporting area, 290 sq. ft.; area of stabilising plane, 14 sq. ft.; overall length, 24 ft. 1 in.; weight, empty, 730 lbs.; speed, 52 m.p.h.

"VEE JAY."

AIR RAIDS: OFFICIAL WARNING TO THE PUBLIC.

ON the 28th ult. the Commissioner of Police issued the following communication through the Press Bureau:—

"The Naval and Military Authorities call the attention of persons using the streets to the danger from fragments of shell, and from bullets from the guns used against hostile aircraft attempting a raid on London.

"The civil population are warned to keep under cover, preferably in basements, upon hearing the sound of firing by guns or of explosives."

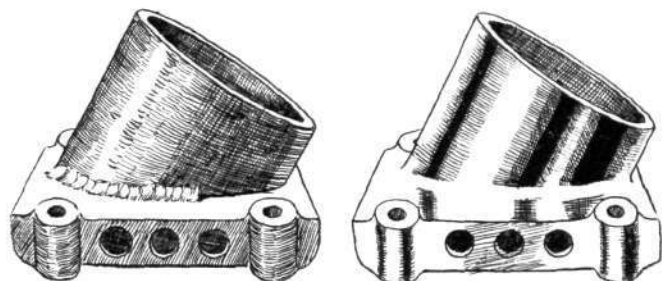
In this connection it may be recorded that the officer

commanding the Portsmouth defences has issued instructions that in the event of bombs being dropped in the district by enemy aircraft, the War Office desire to obtain some idea as to the size and nature of the missiles, and it is requested that in such an event any fragments collected should be handed to the police for transmission to the local military headquarters. The authorities, however, point out that this notice is merely a measure of military precaution, and they do not anticipate any such attack.

WELDING AND HOW IT IS DONE.

OF late years the art of welding has played such an important and constantly increasing part in connection with aeroplane construction and repair that it cannot be without interest to readers of FLIGHT to understand something of the nature of this art as so applied. Many of the small metal fittings of an aeroplane that were at one time aluminium castings are now, owing to the welders' skill, made both lighter and stronger from sheet and tubular steel, even where these parts are of most intricate form, one example of this being the almost universal use of steel strut sockets. Even parts that were formerly constructed of wood are now largely replaced by steel, as in the case of the crank-levers on the elevator and rudder, these being in the majority of cases a hollow steel tapering tube welded along the join and welded to a base plate, the whole unit being in the opinion of many constructors stronger weight for weight than is possible with wood. Welding also enters largely into the construction of many of the larger metal portions of a modern machine, such as the engine frames, the chassis structure and the top and bottom pylons. Of equal importance is the part welding plays in the repairs that are so frequently required to such fragile constructions as an aeroplane and its engine; indeed it is perhaps in this regard that the utility of the welding process is most pronounced.

Welding is the art of intimately and permanently joining pieces of metal (which may be like or unlike) without the use of an adhesive metallic cement, and in



Two aeroplane strut sockets, showing the part played by the welding process in their manufacture.

this respect differs fundamentally from the processes commonly recognised as soldering and brazing. Speaking in a broad sense, there are two distinct forms of weld, one of which is obtained by reducing the surfaces to be joined to a plastic state, and then by hammering or pressure to unite these surfaces by the cohesion of the molecules. In its most familiar form an example of this is the manner in which a blacksmith repairs a broken iron hoop. The second method is to cause a union of the metals by fusion: that is, by bringing the immediate parts to be joined to a liquid state and allowing them to flow together. This is what in common parlance is called autogenous welding, and is that with which we are now concerned. The actual melting of the metal is usually obtained under the action of an intensely hot flame from a blowpipe; in fact when speaking of autogenous welding it is this method that is always implied, though strictly speaking the term is just as applicable to several other processes.

It will probably come as a big surprise to learn that autogenous welding is in all probability almost as old a craft as that employed by the blacksmith; it is known to be a fact that it was commonly practised by the ancient Egyptians in dealing with metals of a low melting point,

lead in particular. Only of comparatively recent years, however, has the process been possible with those metals having a high melting point: to be more precise, since the industrial manufacture of oxygen.

The introduction of this gas as a commercial commodity permitted the production of a flame of far greater heat intensity than any known up to then except in the chemical laboratory, and used in conjunction with hydrogen was the first step in modern developments of the art of welding. The product of combustion of these two gases being exclusively water vapour, tended, however, to a considerable oxidation of the metal in working, and made a sound job impossible without resorting to the expensive artifice of using excess hydrogen. Even then the difficulty was not entirely overcome, and as a consequence other combinations with oxygen were tried, notably oil-gas, benzol vapour, and acetylene, and at the present time the last-named is that most widely adopted for the purpose.

It is little more than thirteen years or so ago that the oxygen and acetylene flame was first employed. So immeasurably superior in every respect was it found to be that its application constitutes the next great step in the development of the art, and from this time dates the beginning of the rapid progress that has since led up to its present position of high esteem in the industrial world. Practically every repair executed to the fractured metal parts of aeroplanes or motor cars is effected by this process, and we shall therefore confine our remarks to this method. Without going more than superficially into the chemistry of the combustion of the flame produced by these two gases, it may be stated that the reasons for their almost universal use are, first, that the products of the first phase of combustion are carbon monoxide and hydrogen, these two being what are known as "reducing agents," which is to say they are the exact antithesis of oxidising agents, while the final products are carbon dioxide and water vapour, both of which are non-poisonous to the operator; and secondly, the intensely hot flame produced, which is about 1,000° C. above that of oxy-hydrogen.

The necessary plant for the production of the flame consists of a cylinder of oxygen, and either a self-generating acetylene installation, or a dissolved acetylene cylinder, also a number of blowpipes, or alternatively one with a series of interchangeable nozzles for use according to the nature of the work and variety of metal. The high-pressure system from a dissolved acetylene cylinder is preferable for important work, in spite of the fact that the cost of the acetylene is from four to five times as great, inasmuch as a nearly perfect mixture of gas can be delivered at the nozzle of the blowpipe; and, more important still, certain impurities such as are always present in gas delivered from generators, consisting mainly of ammonia, sulphuretted and phosphoretted hydrogen, are absent from dissolved acetylene. The presence or otherwise of any of these impurities has a very strong bearing on the nature of the weld, and is of prime importance. This consideration of purity is of equal moment in respect to the oxygen, and because of this only that of a guaranteed quality of at least 98.5 per cent. is suitable for first-class work.

As regards the blowpipes, these are of a type determined by many factors, the most important being the pressure of the acetylene; but whatever the type, their fundamental purpose is the same, i.e., to intimately mix

the acetylene and oxygen in their correct proportions, and to project a flame of absolute stability. Flexible tubing, of sufficient length to allow the operator to reach all parts of the work, connects the blowpipe with the gas reservoirs.

One or more welding tables—which are usually of iron, with a top of fire bricks—and an oven are always necessary items of the welder's outfit, the purposes of the latter being, first, to pre-heat the work for a reason we shall see later, and, secondly, for "annealing" after

the welding has been done. The process of annealing consists of subjecting the article welded to a high heat throughout, and subsequently allowing it to cool off at a certain rate; and its object is to reduce any brittleness of the metal caused by the internal strains induced by the welding or any previous treatment.

Turning from the plant to the exercise of the welder's art, it must be pointed out that, in this as in most other accomplishments, although practically anyone can make some sort of a job after a few hours' practice, it takes years of constant practice and thought to become a really good welder. In proof of that it is merely necessary to reiterate the

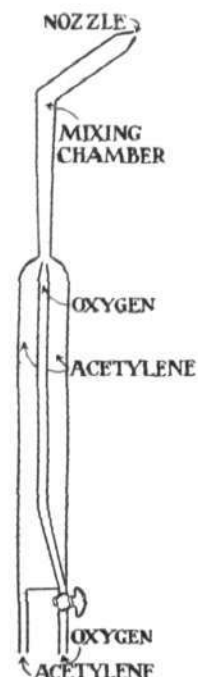
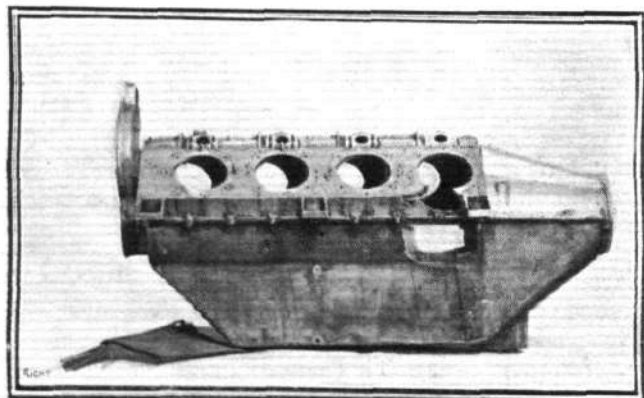


Diagram of a blowpipe for autogenous welding, and on the right the shape of the flame produced.



fact that it is only within the last few years that the art itself has advanced to a degree where a thoroughly dependable job was possible.

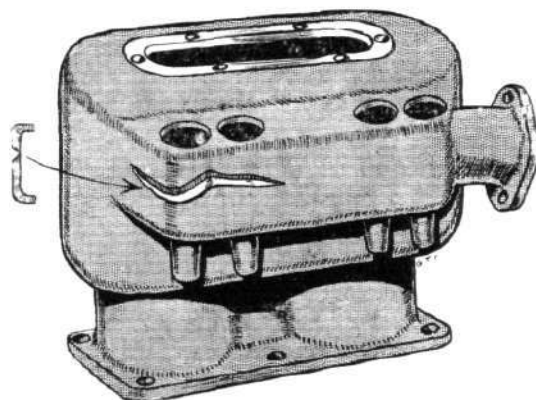
Keeping this fact in view, the apparent simplicity of the operation when witnessing a repair being executed is as misleading as it is astonishing. As an illustration the process of repairing the aero-engine crankcase shown in



The above photograph shows the aluminum crankcase of an eight-cylinder Curtiss aeroplane engine badly damaged as the result of an accident. It will be seen that both sides have been knocked out as well as a part of the cylinder holding down base, all of which parts are missing. The crankcase was sent to Barimars in the condition shown, and the welding department of this firm were able to make a perfectly satisfactory repair to the casting.

one of the illustrations may be followed. The crankcase is made of aluminium, but the process will be similar in the case of other metals, though the temperatures and the composition of the flux and welding-rod will differ. It may be mentioned here incidentally that practically all the industrial metals and alloys are amenable to the welding treatment, though in some few cases the art has not even yet progressed sufficiently to ensure a perfect union in all cases. It is not so long since aluminium was one of these unsatisfactory materials, but the special difficulty in this case is now fully overcome, and as a matter of fact it is now perhaps one of the best "patients," as a good welded joint in this metal can be made of even greater strength than the main body of the casting.

In repairing the crankcase in question, the first thing done is to cut out from sheet aluminium of the requisite thickness pieces approximately filling the holes to be stopped. Then comes into play the first indication of the operator's skill: all contiguous edges to be joined have to be carefully bevelled off so that when in position no holes or excess thickness are produced at the bottom of the bevel, but the whole forms a kind of trough in which the molten welding rod combines with the molten metal of the work and forms a pool. The object of so bevelling is to enable the blowpipe to reach the whole of the surface to be treated, and thus to make sure of



The sketch shows a cylinder casting that has become cracked, and the edges of the crack bevelled preparatory to welding.

melting the metal, and so ensure an unbroken joint, throughout its thickness. Also, by enlarging the line of join in this way, the consequences of too great a localisation of defects are avoided. After this, the bevelled faces and immediate surroundings have to be thoroughly cleaned until the metal is bright.

The next step in the procedure calls for no little experience, especially where, as in this case, "the work" (by which term, it should be explained, is always meant the whole of the unit for treatment or repair) is of a complicated pattern. It consists of arranging and adjusting the parts to be joined so that during the welding they remain perfectly in position in spite of the disturbing and distorting effects of local expansion and contraction. For other reasons also, this matter of allowing for these phenomena is of vital importance, and is one of the most serious considerations of the expert welder, for, at the least, it may very readily give rise to internal stresses in the welded joint that seriously impair its strength, while the effect may be so severe as to cause the joint to break or crack when cooling. The avoidance of this possibility depends on the experience and skill of the operator to a vast extent, and is in some cases guarded against by bringing the main body of the work to a very high temperature either in

the oven before alluded to or while actually on the table by means of the blow-pipe.

Having got the work in position on the table and the necessary adjustments made by means of clamps, &c., the operator proceeds to don his blue goggles, for the heat and the glare from the oxy-acetylene flame are so intense as to be extremely injurious to the naked eye.

Taking up the blowpipe, he turns on the cocks and ignites the gas issuing from the nozzle, and then spends a few moments in regulating the flame to suit his requirements for the work. Holding the blowpipe in the right hand, the operator, in cases where pre-heating in the oven is impracticable or injudicious, proceeds to thoroughly heat the whole of the work for the reason already explained by passing the flame rapidly over it.

After pre-heating, a special flux in powdered form is applied to the surfaces to be united, more flux being added from time to time during the actual welding. The purpose of the flux is to clear the surfaces, promote the fusion of the metal, prevent any undesirable chemical combinations from taking place, particularly that known as oxidation. The composition of this flux differs according to the metal to be worked, and its preparation is a work of specialists, and is often a jealously-guarded secret.

The actual welding operation is now commenced; the operator takes the welding rod in his left hand, and with the blowpipe in his right directs the flame on to the bevelled edges and the welding rod simultaneously. The metals from both immediately assume a liquid form and blend or alloy with one another, and as they do so the operator, giving a peculiar rotary motion to the jet of flame meanwhile, slowly proceeds with nozzle and welding rod to follow the course of the prepared trough, until eventually this becomes filled with new metal from the rod that has coalesced with that of the original casting while in a fluid state. The welding rod, of course, is composed of similar kind to the work.

Having filled up the trough to overflowing in the manner described, the blowpipe is removed and the weld is then effected. It only remains to anneal the casting and to remove all trace of the join by means of a file and emery cloth, and the job is complete.

Simple, is it not? So far as one can see, there is no more skill required than in simple soft soldering, and yet the full success or otherwise of the operation depends, as has already been pointed out, chiefly upon the skill of the operator.

Judgment, such as can only come from long experience, is necessary in the preparation of the work, with every movement of the blowpipe and welding rod, and particularly in the regulation of the temperatures; skill, the result of long practice, is required for the regulation of the flame and the manipulation of the blowpipe in such manner as to prevent oxidation, the formation of bubbles, the burning of the metals and "adhesion," for the slightest trace of these faults, so almost unavoidable by the inexperienced, are each and all sufficient to result in a weak join and perhaps in utter failure. A knowledge of the mechanical and physical properties of all the various industrial metals and alloys, and the ability to determine within definite limits their quality or composition, are another necessary qualification of the expert welder, and not the least important among them.

It will cause no surprise to learn, therefore, that the really expert welder can command a very high wage, but has first of all to pass through a long apprenticeship.

One of the firms who make a speciality of the welding process in connection with the repairs of automobiles and aeroplanes is Messrs. Barimar, Ltd., of 1, Poland Street, W., to whom we are indebted for the accompanying illustrations, and for their courtesy in permitting the inspection of some of this important work in process of accomplishment.

SEAPLANES AND MINE-SWEEPING IN THE NORTH SEA.

OUR double-page picture in the current issue touches upon one of the most dastardly phases of the present war in which the Prussian Huns have violated every International law of humanity and decency, under the cloak of their wonderful creation "Kultur." That seaplanes could be of some assistance in dealing with mines has long been thought possible, and our artist has endeavoured to depict the method of "sweeping" employed in this very hazardous task. That the dangers are recognised by the Government is evidenced by the message from the Lords of the Admiralty last week to Captain Massey Dawson, R.N., commanding the mine-sweeper section at Grimsby, expressing their high appreciation of the men's service, courage, and devotion in carrying out their duties off the Yorkshire coast.

Apropos of this work, a very human article appeared in the *Daily Chronicle* on Monday last from the pen of Mr. J. J. Bell upon these "heroes unsung." When the history of the war comes to be written, the part played by the commanders and crews of the trawlers engaged should have a high place of honour. In regard to the co-operation of seaplanes the following references are instructive:—

Reprint from "The Navy League Annual," 1913-14:—

"AEROPLANE *versus* SUBMARINE.

"There is one phase of utility for aeroplanes which deserves special mention, namely their efficacy as a guard against submarines. I gather that the submarine is a continual nightmare to every battleship. The aeroplane should be regarded as the 'four angels round

my bed' of our childhood's prayers. The air-scout can see the submarine when no one else can, and generally when the submarine cannot see him. In 1912, when a submarine attack was made up the Firth of Forth, the submarines got up to Rosyth unseen by anybody except the aeroplane pilots, who had them in sight all the way. Into anything like clear water an air-scout can see vertically to any depth to which most submarines can dive at present, and when a submarine is running with her periscope showing, the shaft of the periscope leaves a wake which is easily seen from above, though not from any distance at an angle. Thus, both on the high seas and for coastal defence, the aeroplane as a detector and destroyer of submarines has a distinct place in the scheme of things."

Extract from "The Great War," Part 9, Chapter XIV:—

"The most important thing in mine-sweeping is to discover the minefield. Only too often its existence is not known until some unfortunate ship has come to grief in it; but sometimes a mine breaks loose and is seen before it has done any damage; sometimes a mine is carelessly laid and floats idly, but still anchored, on the surface; while the seaplane has added another factor of security inasmuch as an observer up aloft can, on a fine day, and when the sea is not too greatly disturbed, see some considerable distance below the surface, and, perhaps, detect a mine-field in time to warn a following fleet of its existence.

"When the mines have been located the sweepers get to work—and dangerous work it is. They steam in pairs, a strong steel hawser being stretched between them. To this hawser two heavy 'kites' or sinkers are attached, so as to keep it well to the bottom, and the trawlers then proceed slowly to 'sweep' the mined area. As the hawser is drawn along the bottom, it comes into contact with the wire ropes that connect the mines with their anchors, and drags them along. In this way many mines are exploded by coming into contact with each other, and if any are brought to the surface intact they are generally destroyed by light guns being fired at them."



Mine-sweeping in the North Sea, aided by seaplanes, to undo the dastardly work of German "kultur" in strewing mines, for which the British Navy employs trawlers and their crews, largely by reason of their light draught.

below the surface.



anchored mines in the regular channels for neutral shipping. Nothing is more dangerous than this work of mine-
ed that the seaplane has been usefully employed as an additional help in detecting the presence of clusters of mines
(see page 7.)

The Royal Aero Club of the United Kingdom

OFFICIAL NOTICES TO MEMBERS

THE FLYING SERVICES FUND.

Organised and Administered by the Royal Aero Club for the Benefit of the Royal Naval Air Service and the Royal Flying Corps.

SOME time ago Mr. André Michelin, Chairman of the Michelin Tyre Co., approached the Royal Aero Club, with regard to a suggestion he had made to the Admiralty and War Office, that a general fund be established,

"the proceeds of which would be distributed at the end of the war to all British aviators (or their dependents) having accomplished deeds of daring."

Mr. Michelin offered to open the fund with a contribution of £1,000, and asked The Club to undertake the organisation and administration of the Fund.

The Lords Commissioners of the Admiralty and the Army Council, while appreciating Mr. Michelin's generosity, did not think it advisable to establish such a fund, but the following suggestions were made:—

(1) By the Lords Commissioners of the Admiralty—

A General Fund for the benefit of the Royal Naval Air Service to supplement the provision for officers, and especially men, of the Air Service who are permanently prevented by wounds or injuries, received on duty, from contributing to their own support; and for the wives and dependents of those killed in action.

(2) By the Army Council—

A General Fund for the benefit of the Royal Flying Corps to be devoted to the provision of pensions for military aviators permanently incapacitated, and for the families of such as are killed; but it is suggested that the rank and file should be the first to benefit.

Mr. Michelin concurred with these suggestions and confirmed his offer to subscribe £1,000.

The Lords Commissioners of the Admiralty and the Army Council approved of the Fund being administered by the Royal Aero Club, and The Club then agreed to organise and administer the Fund.

A general appeal for subscriptions will be issued shortly.

Aviators' Certificates.

The following Aviators' Certificates have been granted:—

- 1003 Flight Sub-Lieut. George Fred Breese, R.N.A.S. (Grahame-White Biplane, Grahame-White School, Hendon). Dec. 19th, 1914.
- 1004 Flight Sub-Lieut. Gerald Edward Livock, R.N.A.S. (Grahame-White Biplane, Grahame-White School, Hendon). Dec. 20th, 1914.
- 1005 Flight Sub-Lieut. Douglas Meston Barnes, R.N.A.S. (Grahame-White Biplane, Grahame-White School, Hendon). Dec. 20th, 1914.

- 1006 Geoffrey Harold Brinkman McCall (Maurice Farman Biplane, Military School, Brooklands). Dec. 20th, 1914.
 - 1007 Gino Virgilio (Wright Biplane, Beatty School, Hendon). Dec. 20th, 1914.
 - 1008 Ernest Alfred Edward Wood (Maurice Farman Biplane, Military School, Brooklands). Dec. 21st, 1914.
 - 1009 Flight Sub-Lieut. Walter Shackfield Newton-Care, R.N.A.S. (Short Biplane, Royal Naval Flying School, Eastchurch). Dec. 20th, 1914.
 - 1010 Flight Sub-Lieut. Thomas Kenneth Young, R.N.A.S. (Grahame-White Biplane, Grahame-White School, Hendon). Dec. 21st, 1914.
 - 1011 Melville Richard Allen (Maurice Farman Biplane, Military School, Brooklands). Dec. 22nd, 1914.
 - 1012 Leo Francis Page (Maurice Farman Biplane, Military School, Brooklands). Dec. 22nd, 1914.
 - 1013 Lieut. King Davie Harris (K.O. Scottish Borderers), (Maurice Farman Biplane, Netheravon Flying School, Netheravon). Dec. 22nd, 1914.
 - 1014 Flight Sub-Lieut. Harold James Batchelor, R.N.A.S. (Short Biplane, Royal Naval Flying School, Eastchurch). Dec. 22nd, 1914.
 - 1015 Ralph Christopher Freeman (Maurice Farman Biplane, Military School, Brooklands). Dec. 22nd, 1914.
 - 1016 Lionel Macdonald Wells Bladen (Maurice Farman Biplane, Military School, Brooklands). Dec. 22nd, 1914.
 - 1017 Flight Sub-Lieut. William Laurie Welsh, R.N.A.S. (Short Biplane, Royal Naval Flying School, Eastchurch). Dec. 22nd, 1914.
 - 1018 Thomas Vaughan Lister (Bristol Biplane, Royal Naval Aviation School, Hendon). Dec. 23rd, 1914.
 - 1019 Flight Sub-Lieut. Arthur Quilton Cooper, R.N.A.S. (Bristol Biplane, Royal Naval Aviation School, Hendon). Dec. 23rd, 1914.
 - 1020 Flight Sub-Lieut. Charles Beauvoir Dalison, R.N.A.S. (Grahame-White Biplane, Grahame-White School, Hendon). Dec. 24th, 1914.
 - 1021 2nd Lieut. Percy Gilbert Ross-Hume (Maurice Farman Biplane, Netheravon Flying School, Netheravon). Dec. 24th, 1914.
 - 1022 Herbert Prinsep Somers Clogstoun (Maurice Farman Biplane, Military School, Brooklands). Dec. 24th, 1914.
 - 1023 Robert Hobart Mayo (Maurice Farman Biplane, Military School, Brooklands). Dec. 24th, 1914.
- 1065, Piccadilly, W. B. STEVENSON, Assistant Secretary.

FROM THE BRITISH FLYING GROUNDS.

Bowness-on-Windermere.

Northern Aircraft Co.—Monday, Tuesday and Thursday last week were full days, Mr. W. Rowland Ding out teaching either in pilot's or passenger's seat morning and afternoon, Lashmar (170 mins.), Railton (105 mins.), Mackrow (15 mins.), Ashley (10 mins.), Parkyn (10 mins.). The remainder of the week spent in increasing adipose tissue. Heavy load for the engines on Monday; good job they are all Gnomes, taking castor oil.

Brighton-Shoreham Aerodrome.

Pashley Bros. and Hale School.—Up with instructors last week: J. Sibley, A. Goodwin, G. Charley. Circuits and eights: T. Cole, J. Woodhouse, Menelas Babiottis, C. Winchester, J. Morrison. Owing to the exceptionally bad weather Messrs. J. Woodhouse and C. Winchester were prevented from attempting the certificate tests before, but luckily a day free from rain, although not free from wind, enabled them to qualify.

London Aerodrome, Collindale Avenue, Hendon.

Grahame-White School.—Monday last week, Probationary Flight Sub-Lieut. Walmesley, straights with Instructor Winter. Probationary Flight Sub-Lieuts. Dalison, Young circuits, eights, landing practice, &c., Driscoll solo straights and circuits, Mills solo circuits. Afterwards Probationary Flight Sub-Lieut. Young competing for and gaining his certificate in good style.

Tuesday, Probationary Flight Sub-Lieuts. Dalison circuits with Instructor Manton and afterwards alone, Driscoll solo straights and half circuits. Mills solo straights, and Probationary Flight Sub-Lieut. Walmesley straights with Instructor Russell.

Wednesday, Probationary Flight Sub-Lieut. Digby (new pupil) instructive passenger flight and straights with Instructors Russell and Manton. Probationary Flight Sub-Lieuts. Dalison circuits and eights, Driscoll solo straights and half-circuits. Mills landing practice and Walmesley straights with Instructor Manton.

Thursday, Probationary Flight Sub-Lieuts. Dalison,

Driscoll, Mills, solo circuits, eights, landing practice, &c. Probationary Flight Sub-Lieuts. Digby, Reed (new pupil) and Walmesley straights with Instructor Russell. Probationary Flight Sub-Lieut. Dalison afterwards going in for his *brevet* and gaining this in first-class style.

Friday, pupils at work in hangars, owing to fog no flying practice possible.

Saturday, Probationary Flight Sub-Lieuts. Driscoll circuits, Walmesley straights with Instructor Russell.

Sunday, too foggy for flying practice.

Beatty School.—Pupils out last week on "dual"-controlled two-seater machines, with Mr. E. Baumann on 50-h.p. Gnome biplane, and Mr. W. Roche-Kelly on 40 h.p. Wright biplane.

Monday, Messrs. C. Leeston-Smith (8), Anstey-Chave (9), G. Donald (6), G. Perrot (10), B. de Meza (10), J. V. Miller (8), Lieut. Bannatyne (8), and J. H. Ormsby (15). During the morning G. Virgilio took out the 40 h.p. Wright biplane and made some test flights, during which he attained the height of 1,100 ft., and made a splendid *vol plané* from that height with engine cut off.

Tuesday, Messrs. C. Leeston-Smith (12), Newberry (9), Anstey-Chave (24), G. Merton (10), G. Beard (15), G. Donald (10), J. F. Roche (8), B. de Meza (15), J. V. Miller (15), Lieut. Bannatyne (23), J. H. Ormsby (15), and A. G. Hayward (10). During the morning G. Virgilio was hard at work putting in a lot of flying at about 250 ft.

Wednesday, Messrs. C. Leeston-Smith (19), Newberry

(25), Flight Sub-Lieut. Anstey-Chave (15), G. Merton (24), G. Beard (15), G. Donald (11), G. Perrot (10), J. F. Roche (15), B. de Meza (8), J. V. Miller (15), Lieut. Bannatyne (23), J. H. Ormsby (15), and A. G. Hayward (10). G. Virgilio again out by himself putting in a lot of practice.

Thursday, Messrs. G. Merton (15), G. Perrot (16), Flight Sub-Lieut. Anstey-Chave (16), and Lieut. Bannatyne (12). Virgilio again out on 40 h.p. Wright biplane, making a number of fine flights at about 300 ft.

End of week, school closed for Christmas holidays.

London and Provincial Aviation Co.—Monday, last week, school out in morning. Test flight, M. G. Smiles, 10 mins. Messrs. Abel and Laidler straights; rolling, England Derwin.

Tuesday, school out morning and afternoon. Instructors Warren and Smiles. Messrs. Laidler and Abel straights, improving steadily.

Wednesday, school out morning. Test flight, M. G. Smiles, 15 mins. Messrs. Abel and Laidler straights, half an hour each.

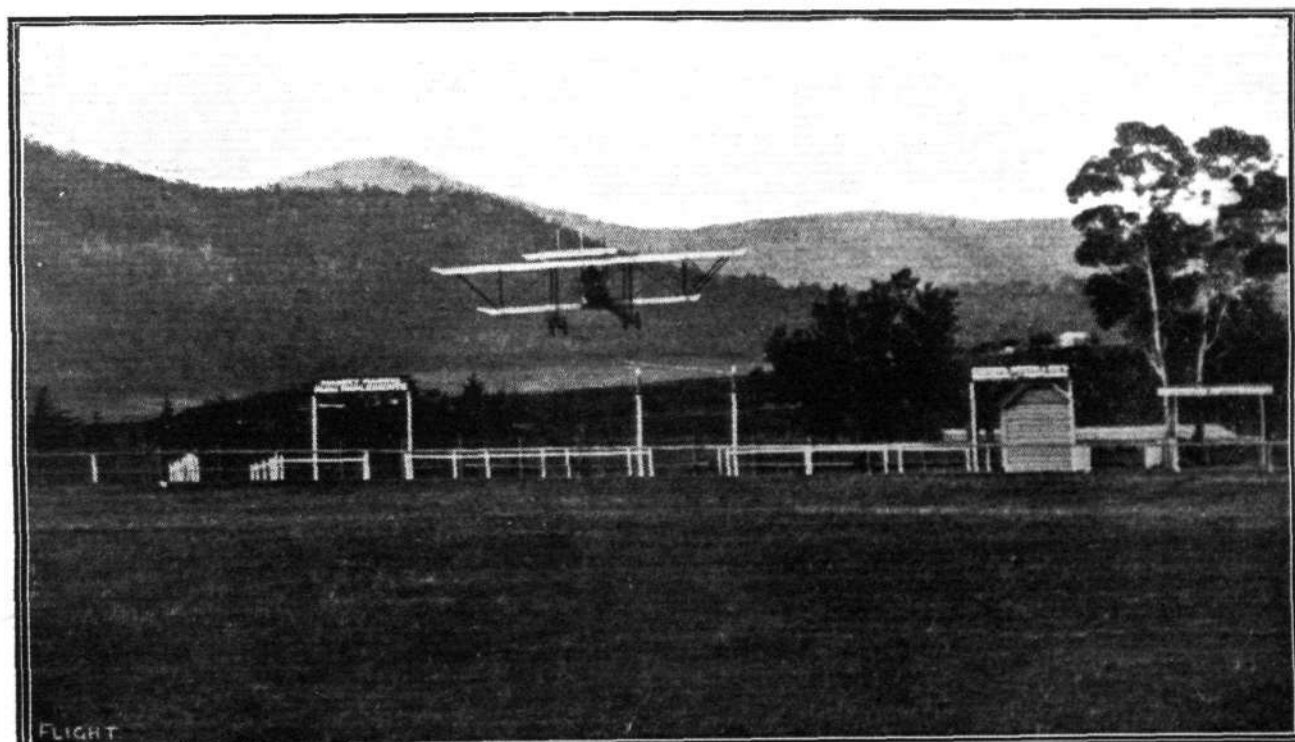
Thursday and Friday, weather too wet for practice.

Ruffy School.—Instructors during last week: Herbert James and Howard James. Pupils receiving instruction: Messrs. Aoyang, Graham, Donald, Marriott, Lacrouts, R. Kenworthy (new pupil). Machines: 60 h.p. Gnome-Caudron, dual control, and 45 h.p. Anzani, single-seater. One 50 h.p. machine is being erected at works, and will be ready in a few days.

✕ ✕ ✕ ✕ EDDIES.

It is not an easy matter in these times to gather authentic news of our friends in the flying world, as reports reach us through, at times, very circuitous routes. Such information as we do manage to collect is very frequently contradictory, and it becomes a matter of some difficulty to ascertain the true facts. A case in point is the reference made in "Eddies" last week to the accidents which were reported to have happened to the two Hendon

pilots, A. E. Barrs and R. J. Lillywhite. These reports I had from conversation with several well-known men in the flying world, who are generally credited with undoubted reliability, and as all the reports agreed closely there was no reason to doubt their correctness. It would appear, however, that there has been some misunderstanding, at any rate as regards the matter of Lillywhite's accident, for a sergeant in the R.F.C.



Mr. Delfosse Badgery flying his 45 h.p. Anzani-Caudron-type biplane at Elwick Racecourse, Hobart, Tasmania.

(M.W.) sends me along the following letter:—"May I put you right in respect to an article in 'Eddies' re Barrs and Lillywhite? I hope A.E.B. is by this time well on the road to recovery, and as for Jack Lillywhite he has never been in France, yet, as a matter of fact, if I am not giving away secrets, he is by this time flying a Henry Farman in Egypt, where he and Sergeant Foggin went some time ago, and as far as I know he is O.K. and still doing great work, if reports are true." I sincerely trust that my informant is correct in his statement of Lillywhite's whereabouts, and I hope that inadvertently I have not caused any unnecessary anxiety to his many friends. To set the matter definitely at rest, I shall greatly appreciate a communication from Lillywhite himself, proving unquestionably that he is well, if any readers are able to assist in this direction.

x x x

Apropos of the death of Marc Pourpe, which was reported recently, his many friends will be glad to know that I hear from a friend in France that as a matter of fact this was not the result of an aerodrome accident. According to a source, which should be well informed, Pourpe was found dead with his passenger about 10 miles from his base after two hours' flying over the German lines. It is believed he was wounded in a fight with a hostile machine, as empty cartridge cases were found in the fuselage, and a rifle was in the passenger's hands. The report about the machine side-slipping while turning is not believed, as Pourpe was too well acquainted with the Morane-Parasol which he was flying.

x x x

News reaches us again of the doings of Mr. Delfosse Badgery, who has been giving numerous exhibition flights in various portions of the Southern Hemisphere. The latest accounts of his evolutions appear in the *Tasmanian Mail*, whose reporter has evidently still a good deal to learn about aeroplanes, to judge from his more

picturesque than technically correct descriptions of Mr. Delfosse Badgery's exploits. According to the above-mentioned paper, Mr. Badgery had arranged to give demonstrations, which incidentally were the first to be given in public in Tasmania, at the show ground at Elwick. After chronicling the notabilities present at the meeting in the approved style, this valuable journal proceeds to describe the first flight, in the following words:—"After a considerable wait, the machine, a biplane of the Cordarian type (!) driven by a 45 h.p. Anzani motor, was pulled out from under its canvas tent on to the oval, running along the ground easily on its rubber-tired chassis wheels, and the City Band played 'See the conquering hero comes.' The airman, clad in black rubber overalls and the regulation tight-fitting, bonnet-shape head-gear of the same material, took his seat on the biplane. The tractor screw (unlike the monoplane, the biplane screw acts as a tractor in front, instead of as a propeller) having been set spinning round, the four men holding the machine back released their grip, and the machine instantly shot forward, ran along the ground about 30 or 40 yards, then rose rapidly and gracefully, like a soaring bird over the land, in the direction of Glenorchy."

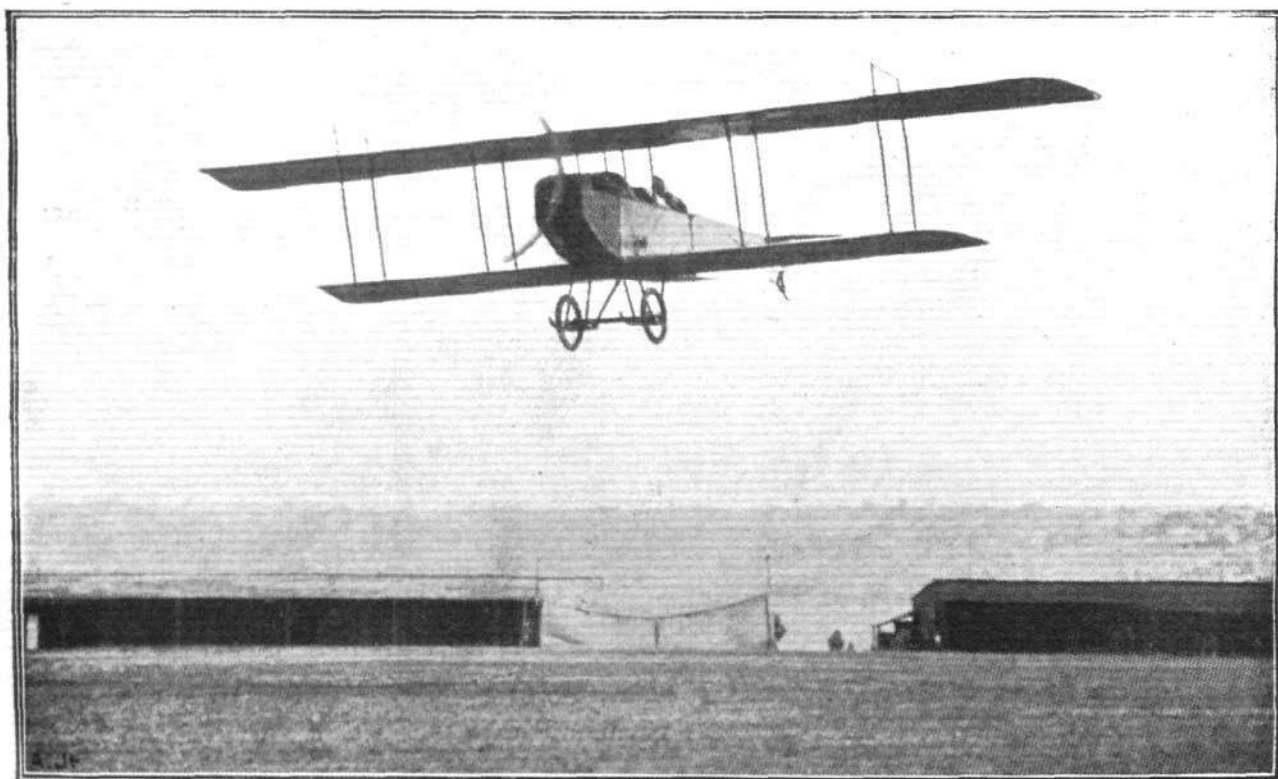
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After a description of Mr. Delfosse Badgery's first flight the reporter then relates the aviator's experiences while aloft: "Meanwhile a slight scudding shower had come on, and he said it was raining hard and very cold up above, that the raindrops hit him in the face severely, and the wind he found to be very trying, while the freezing wind-pockets quite baffled him during his few minutes aloft."

Ah, well, there is no doubt that Delfosse Badgery gets a lot of fun out of his pioneer work, which (referring to the latter, of course), it is to be hoped, will go a long way towards opening the eyes of our antipodean cousins as to the possibilities of the aeroplane.

"ÆOLUS."

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The latest Curtiss biplane, of which we gave details in our issue of December 11th, in full flight. With a 90 h.p. Curtiss motor this machine is claimed to have a speed range of from 40 to 90 miles per hour.

AIRCRAFT WORK AT THE FRONT.

In the descriptive account dated December 21st, issued by the Press Bureau on the 25th, "Eye-witness," in describing the work of the Commander-in-Chief at the General Headquarters, said:—

"He relies entirely on second or third hand evidence of things seen or heard by others over a front of many miles, and communicated back by the agency of electricity or petrol. Messages sent in by telegraph, wireless, telephones, motor cars, motor cycles, and aeroplanes are the daily food of the General Staff, for the handling of this mass of material collected by others, its analysis and its application to the situation for the purpose of framing plans are their work."

Writing of the Divisional Headquarters nearer the firing line, he said:—

"Here in this neighbourhood are to be found the first visible signs that fighting is going on. These do not consist so much in the ruined houses and devastated villages, which are rather proofs of past fighting, and may be in evidence even behind General Headquarters, but consist, paradoxically enough, in the actual absence of any traces of the presence of masses of soldiers, for, though the area from here onwards may contain thousands of troops, all cavalry, artillery, and infantry will alike be so hidden away in villages, in woods, or in folds of the ground that there will be no trace of them in the landscape. This is one result of the all-pervading and all-seeing aeroplane. On the roads, however, at this distance from the firing line the transport will be moving freely."

In another despatch, dated December 24th and issued on the 28th, there were the following references to the work of aircraft:—

"Wednesday, the 23rd, a thick mist militated against air reconnaissance and artillery action. . . .

"Though the weather has been generally unfavourable to aviation, several reconnaissances have been made during the past week, and there have been three encounters in the air between British and German aeroplanes, as a result of which the hostile machine has in each case been forced to go down in the German lines.

"On one occasion our machine chased a Taube, and having attained the favourable position for shooting, the observer emptied his automatic pistol at the enemy, without any visible result, at about 150 ft. range. He then proceeded to take a photograph, and the appearance of the camera seems to have alarmed the German aviator, who at once fled. Upon another occasion a somewhat difficult situation arose when a bomb, which was being dropped, caught in a string, and remained suspended three or four feet below the aeroplane. There was no way of reaching the bomb, and it was impossible to land. Finally the observer kicked a hole through the floor of the fuselage, hooked the string with his foot, and shook it until the bomb fell off."

In an official message from South Africa, published on the 23rd ult., there was the following:—

"A Taube monoplane coming from Aus (German South-West Africa) went as far as Rothkuppe and returned, flying high and wide. It was unable to approach our camps owing to big gun fire. No shells were dropped."

The following announcement was made by the War Office on December 24th:—

"An enemy's aeroplane was seen over Dover this morning about 10.55. It dropped a bomb which fell in

a garden and exploded, but did no damage. The aeroplane was only seen for a few seconds, and left again over sea. British aircraft went up at once, but did not see the enemy again. The weather was foggy and cloudy."

The following was issued by the War Office on Christmas Day:—

"A hostile aeroplane was sighted to-day at 12.35 p.m. flying very high east to west over Sheerness. British aircraft went up in pursuit and engaged the enemy, who, after being hit three or four times, was driven off seaward."

The following announcement was made by the Admiralty on Sunday last:—

"On Thursday last, Squadron-Commander Richard B. Davies, R.N., of the Naval Air Service, visited Brussels in a Maurice Farman biplane for the purpose of dropping twelve bombs on an airship shed reported to contain a German Parseval. Eight of these bombs, of which six are believed to have hit, were discharged at the first attack and the remaining four on the return flight. Owing to the clouds of smoke which arose from the shed the effect could not be distinguished."

The following was issued by the Admiralty on the 27th ult.:—

"On Friday (Christmas Day) German warships lying in Schillig Roads, off Cuxhaven, were attacked by seven naval seaplanes, piloted by the following officers:—

"Flight Commander Douglas A. Oliver, R.N.

"Flight Commander Francis E. T. Hewlett, R.N.

"Flight Commander Robert P. Ross, R.N.

"Flight Commander Cecil F. Kilner, R.N.

"Flight Lieutenant Arnold J. Miley, R.N.

"Flight Lieutenant Charles H. K. Edmonds, R.N.

"Flight Sub-Lieutenant Vivian Gaskell Blackburn, R.N.

"The attack was delivered at daylight, starting from a point in the vicinity of Heligoland. The seaplanes were escorted by a light cruiser and destroyer force, together with submarines. As soon as these ships were seen by the Germans from Heligoland, two Zeppelins, three or four hostile seaplanes, and several hostile submarines attacked them.

"It was necessary for the British ships to remain in the neighbourhood in order to pick up the returning airmen; and a novel combat ensued between the most modern cruisers on the one hand and the enemy's aircraft and submarines on the other. By swift manoeuvring the enemy's submarines were avoided, and the two Zeppelins were easily put to flight by the guns of the 'Undaunted' and 'Arethusa.' The enemy's seaplanes succeeded in dropping their bombs near to our ships, though without hitting any. The British ships remained for three hours off the enemy's coast without being molested by any surface vessel, and safely re-embarked three out of the seven airmen with their machines.

"Three other pilots who returned later were picked up, according to arrangement, by British submarines, which were standing by, their machines being sunk. Six out of the seven pilots, therefore, returned safely. Flight Commander Francis E. T. Hewlett, R.N., is, however, missing. His machine was seen in a wrecked condition about eight miles from Heligoland, and the fate of this daring and skilful pilot is at present unknown. The extent of the damage by the British airmen's bombs cannot be estimated, but all were discharged on points of military significance."

In the *communiqué* issued in Paris at 3 p.m. on Sunday, there was the following:—

"A German dirigible dropped about ten bombs on Nancy in the middle of the town, without there being any military grounds for doing so. Our aeroplanes, on the contrary, bombarded the aviation sheds at Frescati, one of the stations of Metz where movements of trains have been reported, and the barracks of St. Privat at Metz."

A note attached to the French official *communiqué* issued in Paris on Tuesday afternoon, stated:—

"A German *communiqué* mentions that the bombardment of Nancy by a Zeppelin was a measure taken as a reprisal for the bombardment of Fribourg, in Breisgau, by French aviators. French aviators, however, have never engaged in operations unless justified by military

reasons. They have touched nothing in Fribourg but the hangars, the airship construction works, and the station from which the movements of troops were signalled. The French dirigible, which flew over Sarrebourg, bombarded the railway station there, and the points of the railway line Sarrebourg-Haricourt. Our aviators who flew over Metz yesterday threw bombs on the hangars of Frescati, on one of the railway stations, and on the St. Privat Barracks only.

"On the other hand the German bombs thrown on Nancy fell in the middle of the town on a point far distant from any military buildings, and no troops whatever were gathered there. They could, therefore, damage none other but civil buildings, and could not make victims except among the civil population."

AIRCRAFT AND THE WAR.

IN a despatch from Warsaw, dated December 20th, and sent to the *Daily Telegraph*, via Petrograd, Mr. Granville Fortescue said:—

"Again Warsaw has suffered from an air raid. Taking advantage of the beautiful flying weather, three of the enemies' air assassins sailed high over the city. Little larger than the crows they looked to the naked eye as they poised over Warsaw. Exceptional sunshine had brought the city thousands to the streets. When they saw the threatening flying machines they disappeared like frightened fish. Every open door swallowed struggling mobs. The clock of the district court tolled the doleful one as the first bomb fell. It burst with a sharp report, shattering many windows. Three followed, dropping in a distant section of the city. The mangled body of a foolhardy boy is the grim result of the dastardly attack. This and a ruined house, where the timbers still smoulder, is the record of this daring raid. As the aeroplane circled above the roofs a Russian aerogun sent shrapnel after shrapnel behind them.

"The tinkle of the shattered glass was the main sound heard in the explosion. Of course, there was the 'poom' when the bomb struck, but that lasted only a fraction of a second, while the shivered glass fell for a full minute after.' It was the spot where the first bomb fell. I quote the impression made by the explosion on one who heard it a short distance off. Luckily, this shell did no harm to the citizens, but there was evidence of what might have happened if some unfortunate had been near at the time the infernal machine struck. A section of iron railings, 2 in. in diameter, was cut through as sharply as if severed by a compressed-air steel-cutter. The walls of houses were pock-marked with the holes made by the bomb-bullets. Some of these were driven into the sandstone. And of all the windows in the street where the missile fell not one remained. New panes lately put in place had replaced the shattered glass.

"On the morning of the day I arrived here the German aviator assassin spilt another shell on the unfortunate city. This time also he failed to kill. But a description of the torn bodies of the victims of one of these raids, as given me by the American Consul, comes to my mind whenever I hear the whirring of an aeroplane, and there is no redress. Can there be any more dastardly crime committed in the name of war?

"At night, with the right wind, one sometimes hears firing. Yet to all outward appearance the civil population is indifferent to the situation. Indifferent until a distant humming plane sails circling overhead, the citizen knows sounds in the air. Then, as the menacing aeroplane sails circling overhead, the citizen knows that he lives in the hub of the wheel of war."

News were received from Berlin in Amsterdam on the 21st ult. that a hostile aeroplane had passed over Brussels and dropped bombs at Etterbeek. It was fired at by the German soldiers, but escaped. It was reported in Copenhagen from the same source, that a British aeroplane passed over Brussels on the 22nd and dropped bombs on several military establishments. It also escaped the German fire.

A *Daily Telegraph* correspondent sent the following from Petrograd on December 22nd:—

"At Mutno the Germans shot down one of their own aeroplanes, which they thought was Russian. The machine was broken to fragments in the fall, and both officers in it were killed instantly."

According to news received in Amsterdam, a hostile aviator appeared over Strasburg between 3 and 4 p.m. on December 22nd, and dropped a bomb on the suburb of Illkirch, damaging a shed and smashing the windows of a shop. Some of the splinters of the bomb fell in the river, but nobody was hurt. The aviator, who flew at a height of between 1,500 and 1,700 yards, came under the fire of the garrison.

Writing of the Germans being driven back in the Bethune district, Mr. A. Beaumont wrote to the *Daily Telegraph* on December 22nd:—

"Here again, as at Nieuport, they showed their spite when driven away by sending aeroplanes over the town and dropping bombs, one of which fell in the garden of the hospice and killed two little girls, one aged 4 and the other 9. These, unfortunately, were not the only victims, as about ten other civilians were killed and about twenty wounded by bombs from aeroplanes which have flown over the town during the bombardments."

A correspondent of the *Temps* on December 22nd reported:—

"A German aeroplane has dropped several bombs on Bethune, without, however, causing any damage to life or property. The enemy aeroplane was brought down shortly afterwards by English guns in the neighbourhood of Vieux-Berquin."

A correspondent of the *Tyd* reported on Dec. 22nd:—

"An aeroplane, carrying a searchlight, appeared over Bruges at ten o'clock last night. The aviator threw three bombs, which caused heavy explosions. What damage was done is not known."

A *Morning Post* correspondent at Christiania reported the following on December 22nd:—

"An airship has again been observed over the southern Norwegian coast. A telegram from the town of Skien states that yesterday an airship passed, first eastward, then in a direct southern direction, between a quarter past eight and a quarter to ten in the morning. It was observed by a great number of persons. Some people suggested that it was a mirage, but the most general opinion was that it was a Zeppelin engaged in making observations."

Mr. Percival Phillips, writing to the *Daily Express* from the Belgian frontier on December 23rd, said:—

"I have reason to believe that the German airmen have begun using Zeebrugge as a base for aerial raids on the English coast. A reliable informant tells me that a large hangar capable of housing a number of aeroplanes has been erected near the Heyst tram station, in addition to a waterplane landing stage previously reported. German marines say that an airman flew across the Channel during the week-end."

The Dutch *Telegraaf* on December 23rd published a report from Vlieland that a Zeppelin had been sighted at 1 p.m. that day. It came from the west and disappeared in a north-easterly direction. An airship was also seen at Terschelling proceeding east.

In an interview granted by Admiral von Tirpitz, the German Naval Minister, to Mr. Carl von Wiegand, the

Berlin correspondent of the United Press or America, reference was made to the work of aircraft.

Asked as to whether Zeppelins had proved their value as a naval weapon in this war, the Admiral said:—

"I am personally of the opinion that aeroplanes are also extraordinarily well suited to naval warfare. But Zeppelins are far superior to them for carrying heavy loads over long distances."

"Then the Zeppelins in the navy have not remained without a rival?"

"I cannot yet say which of the two types will in the end prove to be the best in the weather conditions in which our navy has to work. But I can say this much, that both are employed for totally different purposes."

"Is there any truth in the report that an invasion of England by Zeppelins is in preparation?"—"I think a submarine war against British merchant shipping would be still more effective."

Writing from Northern France regarding the fighting round Ypres, a *Daily Chronicle* correspondent said:—

"This morning the sun is our travelling companion. It rises warm and radiant as we trudge along the road to Pervyse, in weather that is much more like those last fine days of October than the freezing days of the month of December. So much the better for our soldier lads, who will now be able to dry themselves a bit, and for the aeroplanes which swarm out beyond the enemy lines to discover the composition of the German troops."

"Above Dixmude two observation balloons are swaying in the sky, about 200 metres up. They have that distinctive and ridiculous shape of a sausage with one end bitten off. We can see quite clearly the rigging that supports the car. They are situated one at Gessen and the other at Clerken. As a rule these things are advance signals of a battle. They say that the Germans are preparing at this moment a new offensive. We have little difficulty in believing it."

In an account of some things seen in German recently, a correspondent of the *Times* wrote:—

"In the same town (Mannheim) are the famous engineering works of Heinrich Lanz, which at present are busy building three airships of the same type as the old 'Schütte-Lanz' air-cruiser. One of them is to be ready about the middle of January, the others at the end of February. I have been unable to get near enough to prove the correctness of this personally, but my information is reliable beyond all doubt."

Mr. Perceval Gibbon, in a despatch to the *Daily Chronicle* from Zyrardow (Bzura Valley), sent by courier to Warsaw and Petrograd and received in London on Christmas Day, said:—

"Overhead, two German aeroplanes were reconnoitring the Russian gun positions. From time to time one of these would slide down the air to a lower level for a closer look, and suddenly the air around and under them was filled with the ragged smokeballs of bursting shrapnel. One had been hit the day before; the engine was damaged, and the aviator was captured alive. He is said to be one of the men who recently threw bombs into Warsaw."

A correspondent of the *Lokal-Anzeiger* reported:—

"Four English airmen on Christmas Day flew over the North Sea island of Langeoog—a small island next to Norderney, not far from Borkum, and a short distance from Wilhelmshafen—and threw four bombs on the west end of the island, without, however, doing any damage."

A correspondent of the *Journal*, dealing with the aerial attack on Nancy, wrote:—

"At nine o'clock on Friday morning a Taube flew over the town and dropped two bombs, doing no material damage of any importance. The first bomb, which fell on the military bedding store, was picked up almost intact. The second burst on the roof of the Hotel de la Poste, only a few yards from the cathedral. No one was hit."

"On Saturday morning at 5.20 a tremendous explosion was heard. A Zeppelin, making evolutions at a low altitude, had dropped its first bomb in the Rue Isabey. The dirigible then flew in an oblique direction from west to east, scattering projectiles in the Place Carnot, Place du Gouvernement, and the Parc de la Pepiniere, killing two persons. Twelve other bombs wounded people in different parts of the town, including some soldiers quartered in an inn, while a house occupied by General de Lavilleon suffered severely, as did the church of St. Eupre, the magnificent coloured glass windows of which were smashed to atoms. A dozen or so shops and a number of dwelling-houses were more or less seriously damaged. Two bombs were thrown almost on top of President Cornot's monument."

A *Times* correspondent, in a despatch from Nancy on Saturday, said:—

"The airship, which probably came from Metz, came down the valley of the Moselle and the Meurthe. At Frouard, six miles off, it dropped three bombs. Frouard telephoned the news to Champigneulle, and Champigneulle to Nancy, where the Zeppelin arrived just as the message was coming through. At the station it followed the course of the railway line for a few hundred yards, then turned sharply to the right and the east, after dropping three bombs, which fell through the roofs of two houses and shattered them. Another fell 100 yards further on in the middle of a big open place, the Cours Léopold, where it smashed one or two trees; a splinter of glass from one of the windows which it broke in the houses along the east side of the square killed a waiter who was asleep in bed. His wife was only slightly wounded on the arm. Beside the waiter one woman was killed and about ten people wounded, including two or three soldiers."

"The aeronauts dropped their two photographs as they passed on their kindly flight, with a message written on each conveying best Christmas wishes—'Fröhliche Weihnachten'—to Nancy—from the Kaiser."

Advices from Basle state that a violent battle took place along the whole line of the Vosges on the 25th and 26th ult. Before the battle began, French aviators flew over Mulhouse, making reconnaissances, and the French artillery afterwards opened a deadly fire.

With regard to the raid on Brussels, officially reported on p. 13, an official telegram from Berlin admits that a hostile airman within the last few days threw bombs at a new Zeppelin shed, but denies the statement of a London newspaper's report from Dunkirk that the shed was hit.

The Berne correspondent of the *Morning Post*, writing on December 27th, said:—

"It is reported that the Aviatik biplane works have been removed from Freiburg, in Breisgau, which has been several times bombarded lately by French airmen, to some town in central Germany. Originally these works were at Mülhausen, whence they were removed at the beginning of the war to Freiburg."

Writing to the *Daily Mail* from Northern France on December 28th, Mr. G. Ward Price said:—

"The thick fog that suddenly settled down over Flanders on Christmas Day had one odd result; it immobilised all the aeroplanes of the allied armies just where they were. The British and the French air scouts out on their ceaseless tours of patrol and reconnaissance had to come down just as soon as a local break in the fog enabled them to get some dim idea of the ground. Those that were out over the enemy's lines had to make the best of their way back by compass, and then grope for a safe alighting ground through the fog. The danger that the fog brought may be judged from the fact that it was only a sudden bad taste and smell in the air that told two airmen who were returning from their patrol beat in the bitter cold of 7,000 feet up that they were coming down right on top of a town. It is testimony to the airmanship of English military flyers that there were no serious accidents. One or two machines which landed on plough instead of flat ground owing to the fog broke a strut or a wheel, and had to be left where they were until a repair squad with spare parts reached them from the base by car. In addition to the more striking raids over the enemy's country that are made from time to time there is an immense amount of courageous, patient routine work being done from day to day by the Royal Flying Corps. The cold alone that must be endured flying at the height of 7,000 ft., which is the lowest to give even comparative immunity from German guns, is so severe as to make a two hours' flight literally a torture. And the dangers of the service increase from day to day, for with constant practice the gunners of the German anti-aircraft guns are becoming more and more expert."

In the wireless news sent out from Berlin on Sunday there was the following reference to the Cuxhaven raid:—

"It is reported by the Admiralty that some British ships made a dash into a German bay, and afterwards waterplanes, conveyed by them, advanced over the mouths of German rivers and dropped bombs on ships anchored there and on the gasworks near Cuxhaven, but without doing any damage. The waterplanes were fired at and withdrew in a westerly direction."

"After this a German airship and aeroplanes reconnoitred against the British forces and hit by bombs two British destroyers. One of the convoy ships took fire, but fog prevented a continuance of the fighting."

Models

Edited by V. E. JOHNSON, M.A.

Models Driven by Compressed Air.

(Continued from page 1240.)

Copper and Brass Foil Containers.

As already stated, the steel, of which the container shown in last week's issue was constructed, cannot be obtained commercially, but copper foil of the same weight and $\frac{1}{1000}$ th of an inch in thickness can be purchased at the rate of 2s. 8d. per lb. from Messrs. Stanton Bros., Blackfriars, and the writer has constructed two such containers exactly similar to the steel one, save that the steel wire is more closely wound round it, about twice the quantity being used; such a container, with closed hemispherical brass ends, but without fittings such as valves, taps, &c., comes out at just 3 oz. They are quite rigid, and stand the pressure all right.

The thinnest brass foil that I could obtain had a thickness of $\frac{1}{1000}$ th of an inch: its cost is at the rate of 1s. 4d. a lb., or half that of the copper; the width of both these foils is 6 ins. Of the two the thicker brass foil appears to be the more serviceable, and I am constructing a double or twin container of this 3 ft. 9 ins. in length and 2½ ins. in diameter; the capacity of this container is about 2½ times the one shown on the Bragg-Smith model, the weight of which (see Mr. Boniface's letter below) is 10½ ozs. In the twin container the four brass hemispherical ends weigh 2 ozs. The weight of the cylindrical cylinders is not yet known, but a strip of the brass foil 7 ft. 6 ins. long, 6 ins. wide, weighs 4 ozs. 1 gramme. Allowing for wiring, solder, &c., it appears that the container should not weigh more than 12 ozs. As to the cost, the four brass knobs from which the brass ends are taken cost 1s. 3d., the brass foil 1s. 4d., to which we have to add the steel wire between 6d. and 1s. possibly, and 3d. for a cycle valve and 1s. 3d. upwards for a tap, and a certain amount of solder, call it 5s. altogether, quite a small amount taking into account the capacity of such a container.

The reason why a larger diameter single container is not being made, is because a 2½-in. light brass knob is so far the largest that I can obtain ready made, and it is desired in this case to construct a container from materials which can be obtained ready to hand.

In addition to the above a tractor container, cone-shaped with hemispherical ends, will also be made, the larger hemisphere will have a diameter of 3.75 and the smaller of 1½ ins. The full length of this reservoir is about 4 ft. and its capacity 1½ times the "Autoplan" one. The diameter of the larger hemisphere could of course be greater, up to at any rate 5 if not 6 ins., if more capacity were desired. The 3.75 hemisphere is being spun for the writer by Messrs. J. Bonn & Co., from 28 gauge brass. Messrs. Bonn & Co. are prepared to spin such domes up to practically any size at prices ranging from about 1s. 6d. upwards according to size. Technically such a container as the above is known as a truncated cone with hemispherical ends. The capacity of such containers can be calculated from the following formula, where V = volume, h = height or length, and R and r = radii of large and small ends respectively, $V = \frac{1}{3} \cdot \frac{22}{7} \cdot h \cdot (R^2 + Rr + r^2)$.

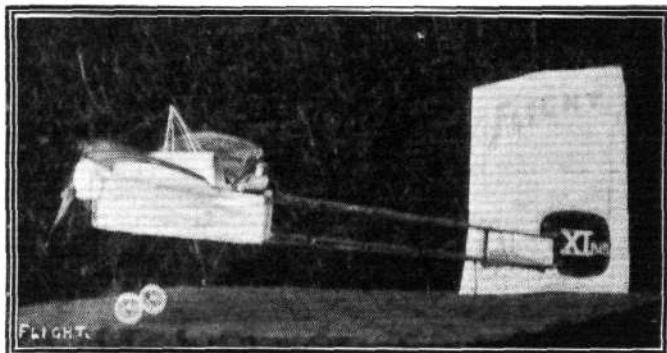
Such a container does not possess a theoretically correct streamline form, but many years ago the writer carried out a series of experiments, on a large whirling machine of some 20 ft. rad. on the air resistance experienced by such bodies, when the above shape

was balanced against a similar one of "mackerel" or fish-shaped form, it was found to offer practically the same resistance at low velocities, i.e., up to about 20 miles an hour.

Leakage.

Having successfully designed and constructed a container for our model, there next arises the question of the motor, and this at once brings us up against the question of leakage.

There is no difficulty whatever in making the container and valve airtight, once this is done leakage may occur at three places, viz., the tap, the motor valve, whether slide, rotary, &c., and between the piston and inner cylinder walls; the tap presents no especial difficulty, and has, in fact, already been dealt with. With respect to piston leakage, one's thoughts naturally turn to the instrument which fills the container, viz., the pump; what forces air in can obviously keep air from coming out. Now, on examining any good air-pump we find beneath and attached to the lower side of the piston a cup-shaped leather washer well soaked in oil. If we adapt

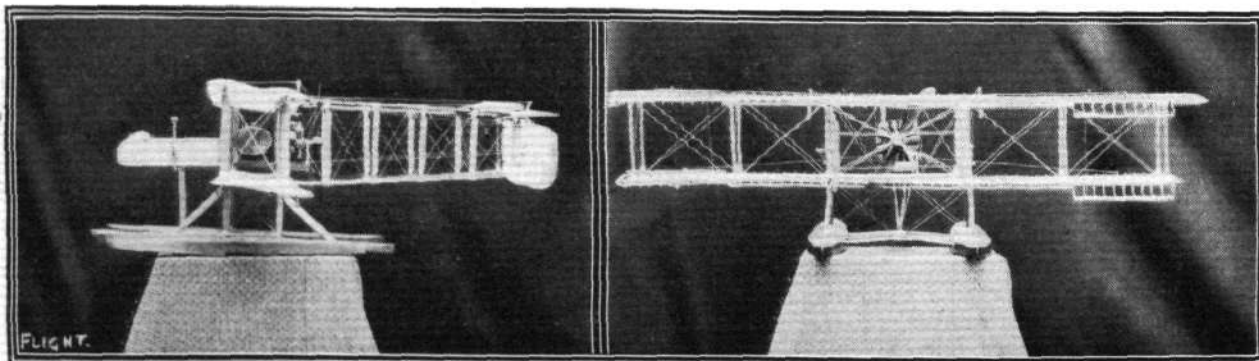


A scale model Blériot built by Mr. O. A. Wood, of South Dunedin, New Zealand.

such a device to our motor piston leakage can be successfully overcome, and with but a trifling increase of friction, a very important point.

With regard to motor valve leakage, the matter is not quite such a simple one, but with well-ground valves, valve walls and wall chest with suitable springs, much can be done. To show how all-important this question of leakage is (far more important even than in the case of a flash steam plant where fresh gas, and therefore fresh pressure, is continually being created), let us take a concrete case. When the little engine shown on the 10 oz. model is running freely under a good pressure, it appears to be working quite well and satisfactorily, but having again pumped up the reservoir, place the engine at its dead centre and turn on the tap, and so great is the leakage that the container empties itself nearly as quickly as when the engine is running; under such circumstances it is not surprising that 30 pump strokes give, practically speaking, no longer a duration than 20 and so on.

Of course the engine contains no packing of any kind, which would greatly increase its efficiency.



Scale model by Eric L. Wright, one-sixteenth full size of the Wright seaplane, exhibited at the last Royal Aero Show at Olympia on Messrs. J. Samuel White and Co.'s stand.

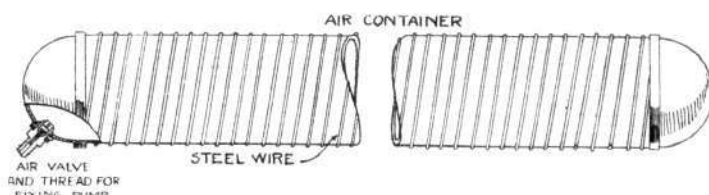
A really satisfactory compressed-air motor should, when set at the dead centre and the tap turned on, show no sign of leakage even when tested in oil. The autoplan motor referred to below does not fulfil this test, although, considering its original price, it is undoubtedly a very good motor. There is no doubt there is a good opening for a simple, cheap and efficient motor capable of giving a 6 to 8 oz. thrust at a pressure of about 110 lbs. and suitable for flying a compact model of the biplane type, of a total weight of about a pound.

(To be continued).

The "Autoplan" Compressed-Air Plant.

Mr. A. G. Boniface (Wimbledon and District Model Aero Club) sends us the following very interesting communication with respect to the above plant, similar to the one shown on the Bragg-Smith model:—

"Referring to your article on models driven by compressed air in last week's issue, I am able to give a few particulars of the



'Autoplan' compressed-air plant. The weight of the motor, including the front shaft, bearing and the throttle, is $3\frac{1}{2}$ ozs. exactly, and that of the container just under $10\frac{1}{2}$ ozs., which also includes the engine mounting and wire cage. Thus the complete plant weighs 14 ozs.

"The weight of the 'fuel' in these plants forms another interesting question. Sixty pumpstrokes of the pump which is supplied with these machines turns the scale at exactly $\frac{1}{2}$ oz. The average number of strokes given to a container for each flight going 'all out' is about 210. Thus the compressed air adds approximately $1\frac{1}{2}$ ozs. to the weight of the machine when empty.

"That the weight of this plant is not by any means excessive considering the power developed is shown by the following test. The weight of my own model is $27\frac{1}{2}$ ozs., or a good 29 ozs. when pumped to the above number of strokes (pressure about 145 lbs.

AFFILIATED MODEL CLUBS DIARY AND REPORTS.

Club reports of chief work done will be published monthly for the future. Secretaries' reports, to be included, must reach the Editor on the last Monday in each month.

Paddington and Districts (77, SWINDERBY ROAD, WEMBLEY).

Monthly Report.—During the past month very little flying, the only work of note being trials by Mr. A. Rasmussen with a twin-tractor model. Several flights were made, but the stability of the model appeared to suffer from insufficient fin area. On Dec. 12th, a special general meeting was held at 77, Swinderby Road, Wembley, when a discussion on research work and the best means of carrying it on was introduced by the secretary, who pointed out that the lull in competitions owing to the war gave members an opportunity which should not be lost of doing other important work. It was pointed out with emphasis that models for purposes of research work must be well constructed, and in particular fuselages and planes should be rigidly built. The weight of such models would necessarily be slightly more than the usual run of record breakers, but this would be amply compensated for by the results achieved. Some of the subjects outlined for investigation were:—Propellers: Their diameters, width of blade, and pitches. Planes: Angles of incidence and cambers. Fins: Areas and positions. Air Currents: Streamlines formed around various objects. Flying speed of different types of models, measuring speed whilst in actual flight. Before concluding the meeting, the secretary explained by means of diagrams on the black-board the principles of the Merrill staggered converging biplane, an aeroplane with neither elevator nor tail. A sketch of a new plane was also shown, its two-fold object being a high lift/drag ratio combined with insusceptibility to side gusts. Some of the problems introduced at this meeting will be further discussed at the annual general meeting in January, of which members will receive due notice.

South-Western Aero Club (373, BRIXTON ROAD, S.W.).

JAN. 16TH, competition on Brockwell Park at 2.30 p.m. for enclosed tractors (rubber enclosed).

Monthly Report.—Owing to the preparations for Christmas things have not been very brisk. Several machines are in course of construction for the competition on Jan. 16th. The result of the target contest was disappointing, in spite of the fact that the weather was anything but unfavourable. At a meeting on the evening of Dec. 12th, it was decided to award Mr. F. Miller's prize to Mr. S. Smith and the club's second prize to Mr. J. Reid.

Stony Stratford and District Kite and Model Ae.C. (OLD STRATFORD).

JAN. 6TH, monthly meeting at clubroom. Jan. 2nd, December competition, at 2.30. Jan. 16th, January competition, at 2.30.

Monthly Report.—At a members' meeting, held Dec. 2nd, the subject was "Frame Tests." The annual report and balance sheet were read and passed. Attention was drawn to the absence of protectors at the last competition, it being resolved to strictly enforce the rule relating to the same. Arrangements were made regarding the club sales of materials, &c. Correspondence was read from the Scottish Model Ae. Club, and their trial of our club competition rule. It was decided to collect from members only for one wing of the air service.

per sq. in.). When held vertically with the engine running 'all out' the model rose easily, and would have come into rather violent contact with the ceiling had I not held on securely. The thrust was sufficient to hold the machine vertically for a period of about $\frac{1}{2}$ of the useful run of the motor, 25-30 seconds. The tractor used was a $15\frac{3}{4}$ -in. Chauvière type of 23 ins. pitch. Incidentally visitors to Wimbledon Common during the last few months have probably noticed that one of the outstanding features of the compressed-air models was the manner in which they climbed at the start of a flight."

With regard to the foregoing, the Autoplan plant is, of course, of German origin, and can no longer be obtained in England. Messrs. A. W. Gamage, however, inform us that they are putting a similar motor on the market at 12s. 6d., and have promised one for our inspection. The price of the German motor was 7s. 6d. Mr. Boniface's information with respect to the increase of weight with increase of pressure is especially interesting; it is this and similar kind of experiments that are so much needed.

Desiccated Air for Compressed Air Motors.

Mr. O. Hamilton, Junr., writes as follows with respect to the above:—

"With reference to your article on Compressed Air Motors, my father and I have been discussing the subject, and I mentioned the fact that you proposed making some experiments with reference to heating the air in the container, and in the course of our conversation he said that the best way to use compressed air was to use it 'dry,' the drying being carried out by using a filter charged with a desiccating substance, the air being blown over this as it is charged into the container by the pump; the air being dry will not on its expansion cause such a rapid fall of temperature as it does not absorb such a large proportion of moisture in the operation, and hence will not freeze.

"I am offering the suggestion of drying as a possible means of a light and handy method of experiment."

[The question of freezing of course depends very largely on the extent to which the container is charged.]

Aeromodellists Serving with the Colours.

Amongst aeromodellists at present serving with the Colours one of the best-known and most successful in open competitions is Mr. Leonard H. Slatter, of the Wimbledon and District Model Aero Club, who is at present in the armoured car section of the Royal Navy Air Service.

Will members who have promised please forward their contributions. Regular weekly flying has been impossible, owing to the rough winds, wet, &c. On Dec. 19th, Mr. Mennell turned up with a hollow-spar diamond shape, the first built in the club and by this member, which did credit to its builder. The weather was very rough, and at first the machine was underpowered, but making good this deficiency, he obtained 51 secs. and 280 yards, when the machine landed in the road and, unfortunately, the kind Samaritan who picked it up, in putting it over the hedge, broke the main plane. The December competition was postponed till Saturday, Jan. 2nd (to-morrow). Brown reports 110 secs. from a bench test of one of his singles, so we expect a little movement shortly.

Wimbledon and District (165, HOLLAND ROAD, W.).

JAN. 2ND AND 3RD, flying as usual.

Monthly Report.—There has been very little flying during the past month owing to the inclement weather which has prevailed. Compressed Air Models. —Messrs. Boniface, Tucker, Chown, and Hayden have flown c.-a. models. Mr. Boniface's monoplane has been flying in its usual good style, doing durations up to 35 secs. Mr. Tucker's Avro has been out on several occasions, flying very fast at a good height. Mr. Chown's tractor-monoplane has been out twice, the best flight being one of 32 secs. The first trials of Mr. Hayden's new machine took place on Wormwood Scrubs on the 27th. Two flights of 35 and 39 secs. respectively were obtained. In the second flight the model reached a height of over 150 ft., but owing to the collapse of a strut a nose-dive brought it down at a very steep angle, doing some damage to the forward portion of the fuselage. This, however, will be repaired, and the machine will be out again next week. Rubber-driven Models.—Mr. W. G. Smith has flown a small fast twin-screw doing long distances. Mr. Powell and Mr. Chown have flown 3-oz. twins. Mr. Hayden has occasioned great excitement with his tiny Sopwith scout, which performs most agreeable stunts.

UNAFFILIATED CLUBS.

Finsbury Park and District (66, ELFORT ROAD, Highbury, N.).

JAN. 2nd, 3 p.m. Distance and duration contests (h.l. all types) prizes value 4s. 6d. and carved propeller presented by secretary.

Monthly Report.—There has been much less flying this month chiefly owing to the inclement weather experienced. Mr. F. E. Raynor who has previously been addicted to twin-screw machines, brought out a tractor of the Morane type which acquitted itself well. Other members flying include Mr. G. Wren (Morane), B. H. Barnard (Morane), A. Richards (Deperdussin), H. Mullin (Morane), A. Savage (Antoinette). All machines this month have been tractors and monoplanes.

Liverpool Aero Research Club (62, CEDAR GROVE, LIVERPOOL).

All model flying during January to take place at Clubmoor, Saturdays at 2.30 p.m. prompt. Discussions: Jan. 13th, at 62, Cedar Grove; Jan. 27th, at 22, Eton Street, 8 p.m. prompt.

Monthly Report.—Wretched weather has interfered greatly with model flying, one competition having to be postponed twice, whilst Dec. 5th, 19th, and 25th were blank days. On the 12th, despite a gale, Tear, Bennett, and Kilshaw turned out with r.o.g. biplanes. F. Lowe has had out a fine racer, which in spite of this period of gales made some good flights. On Boxing Day a good attendance was recorded, when the r.o.g. duration competition was held

there being six competitors, who finished in the following order:—T. W. Bennett, 31 secs.; F. Lowe, 28 secs.; E. Kilshaw, G. Kilshaw, B. Tear, J. Kilshaw. The timekeeper was Mr. W. Beale. On the whole durations were most disappointing, the best flying taking place after the competition itself, the winner nearly doubling his times afterwards, his machine being his favourite arrow-type, and a fine stable flyer. At the general meeting, at Eton Street, on the 30th, it was decided to make all members who enlist honorary members for the duration of the war. New club badges are being placed in hand, the design being in the form of outspread wings in gilt on a blue centre, with a white outer ring bearing the club name. These are to be supplied to founder members at 2s. and to all other members at 2s. 6d. Aero Research "Trophy" Competition, Fourth quarter, Feb. to April. 1. This event is open to members of the Liverpool Aero Research Club only. 2. And is for rise-off-ground models of the single-screw tractor type. 3. The fuselage must be of a minimum length of 34 ins. and a maximum length of 36 ins. of any design. 4. The motive power may be anything the competitor may select. 5. Who may repair or add to as often as it is necessary. 6. The complete model must be made by the entrant, with the exception of propellers, wheels, and motive power, and competitors must be ready if called on to show receipts for materials bought and used in its construction. 7. The weight must be at least 8 ozs. 8. The flights will be timed beginning 2.30 prompt at Clubmoor on Feb. 6th or 13th, 1915. 9. The highest total seconds duration of 3 flights shall be the winner. 10. Competitors must not assist models to rise by pushing, &c., under penalty of being disqualified. 11. Artificial rising surface will be provided. 12. The Judge's decision is final. 13. Entries will be received up to Jan. 23rd, 1915.

Scottish Ae.S. Model Ae.C. (5, DOUNE QUADRANT, GLASGOW).

JAN. 9TH and 23rd, Paisley racecourse, all types.

Monthly Report.—At Paisley racecourse, on Dec. 10th, Messrs. Pinney, Ross, and Balden testing single-screw tractors, in rather foggy weather with a temperature considerably below 32°. In the course of a week or so two compressed-air models will make their appearance, one a tractor the other of the "pusher" type. Any member who knows of a suitable flying ground nearer the city than Paisley might communicate with the secretary. Members are reminded of the waterplane competition on Saturday, March 6th, for medal kindly presented by Col. John A. Sillars.

Twickenham and District (74, CLIFDEN ROAD, TWICKENHAM).

JAN. 1ST, meeting at 8 p.m. at the above address. Jan. 2nd and 3rd, meeting at the Molesey Rugby Football Ground from 2 p.m. and to 10 a.m. respectively.

Monthly Report.—This month has witnessed some splendid flying, the large number of different types being specially noticeable. In the earlier part of the month Mr. Maughan-Ferry had out his compressed-air machine, the wind on that particular day being rather gusty it was a debatable question as to whether the machine should be tried. It was decided to test it, however, the engine was giving about 25-oz. thrust, and combined with a touch of over elevation continued to put the 'bus through some very credible climbing tests. The duration was not great owing to the wind beating her down, and in landing sustained injuries more or less great. Besides the above machine Mr. Maughan-Ferry has had out two waterplanes, one being of the A-frame type formed of two hollow spars, the floats being covered with "Cellon" sheet, the other being a hollow spar T-frame with Maurice Farman-type floats; both machines being very successful, although their flights were limited owing to numerous trees encircling the lake. Mr. Franklyn had out a 4-ft. hollow-spar single-screw machine, but it is, however, only in the tuning-up stage, this length single-screw machine being rather unwieldy. Messrs. Rice-Skinner and Franklyn have had out a waterplane, but at the time of its completion the lake was ice-covered, but flights up to 35 secs. were accomplished, the 'bus rising off the ice in a remarkably short run. Mr. Ord has had out a single-screw r.o.g. machine, but it was unfortunately broken in its trials; he is now bringing out a 4-ft. single-screw machine with which he hopes to break the particular record. Mr. Clayton has been building yet another 4-ft. machine, so that soon a special competition can be organised for this type of machine. Messrs. Clayton and Ord have had out their weight-lifter, obtaining 25 secs. duration, but that of Messrs. Franklyn and Rice-Skinner still remains clinging to the roof of their workshop waiting for better weather. Trying a 4-ft. 'bus on Sunday morning last, the secretary had the misfortune to lose his machine, it having flown into some market gardens, and was confiscated by an irritable labourer. The club as a whole is progressing vastly, but there is evidence of slacking—if one is permitted to use this much hackneyed word in these columns—among the junior members, and the opportunity is taken here to make an appeal to these members and ask them to start the new year well.

Australia Presents an Aeroplane.

At Farnborough on the 23rd ult., Lord Desborough, of the Imperial Air Fleet Committee, handed over to the War Office a B.E.2 C aeroplane which has been placed at the disposal of the War Office by the Australian Commonwealth, to whom it was presented by Mr. William E. Cain, of Liverpool. The machine is to be held in trust for the use of the Royal Flying Corps, and it is to be forwarded to the front immediately. Among those present at the ceremony were Mr. Mervyn O'Gorman, Superintendent of the Royal Aircraft Factory, and Capt. T. O. Lyons, who is attached to the Department of Military Aeronautics at the War Office. Previous to the formal presentation, the aeroplane was christened "Liverpool," by Lady Reid, a small bottle of champagne being broken on the propeller. Unfortunately, Sir George Reid, the High Commissioner for Australia, was unable to be present, as he is away in Egypt.

Subsequently, Lord Desborough and Capt. T. O. Lyons, R.F.C., were taken for short trips in the machine.

Fatal Accident at Hendon.

It is with great regret that we have to record the death of Flight Sub-Lieut. Bernard O. Ffield, of the Royal Naval Air Service, as the result of an accident at Hendon on December 24th.

At the inquest, which was held on Monday, Flight Lieut. Eric Bauman said that Sub-Lieut. Ffield had qualified for his pilot's certificate about a fortnight previously, and had flown alone on several occasions.

Flight Sub-Lieut. Francis Strong, who witnessed the accident, said the deceased went up in the biplane about 9.15 on Thursday morning, circled the aerodrome, and then climbed up to a height of 2,000 ft. Coming back, he appeared not to have left himself sufficient room to fly to the ground before reaching the shed. In order to get down quickly he dived steeply, was unable to recover, and the machine struck the ground with considerable force.

Flight-Lieut. Hodsoll, who also witnessed the accident, agreed that it was due to an error of judgment. He had made a flight in the same machine an hour before, being in the air for sixteen minutes, and had found everything in perfect working order.

After medical evidence had been given that death was due to concussion of the brain and a fracture of the spinal column, the jury returned a verdict of "accidental death."

The funeral took place with full naval honours on Tuesday, the first portion of the service being held in the Catholic Church, Hendon, and the body being taken on a gun carriage, drawn by petty officers from Sheerness, to Hendon Park Cemetery. The chief mourners were Lieut. Ffield's father and mother, and there were also present Capt. Murray Sueter, Director of the Air Department, Admiralty, Flight Commander Porte, and officers from the aerodrome. The firing party was provided by the Royal Marines.



CORRESPONDENCE.

Two-Tailed Aeroplanes.

[1894] In the current issue of FLIGHT (December 18th) you illustrate and describe an aeroplane suggesting* the two-tailed, twin-elevator aeroplane which is protected by my patents (particularly by No. 3848/13), and which has also been illustrated and described in some of its best forms, as mine, in my book, "Aeroplanes in Gusts, Soaring Flight, and Stability" and "How to Understand Aeroplanes," other books by other authors, and in periodicals.

I feel sure you will appreciate the justice of my asking you to give this letter the same publicity as the article.

S. L. WALKDEN.

43, Collingwood Avenue, Muswell Hill, N.

December 23rd, 1914.

* [We suggested nothing in this connection. We merely described an aeroplane which was worked out in America by Edwin R. Carey in April, 1910—and said so.—ED.]



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"Aluminium: Facts and Figures." The British Aluminium Co., Ltd., 109, Queen Victoria Street, E.C. Price 3s. 6d.

Rendiconti delle Esperienze e Degli Studi. Vol. III, Parts 3 and 4. Rome: Tipografia della R. Accademia dei Lincei. Price 5 lire.



Aeronautical Patents Published.

Applied for in 1913.

Published December 31st, 1914.

28,731. J. S. FAIRFAX. Flying machines.

Applied for in 1914.

Published December 31st, 1914.

5,132. E. SCHWYZER. Prevention of fire in case of accidents to aeroplanes, airships, &c.
13,234. R. MERKL AND G. SCHNURR. Dirigible balloons.
13,457. L. E. TICHENOR AND TICHENOR SPRING WHEEL CO. Spring wheels.

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